A PRACTICAL TREATISE

SURGICAL DISEASES

OF THE

GENITO-URINARY ORGANS

INCLUDING

SYPHILIS.

DESIGNED AS A MANUAL FOR STUDENTS AND PRACTITIONERS

WITH ENGRAVINGS AND CASES.

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PREFACE.

The steady growth of the science and art of surgery has involved a corresponding increase in bulk of the text-books in which its principles and practice are set forth—an increase already suggestive of either a limit in bulk soon to be reached, or the omission or slurring over of special subjects. In this alternative the preparation of text-books on special subjects would seem to be the appropriate remedy.

The tendency of mankind to aggregate in large and constantly-increasing cities has led to a corresponding tendency to the growth of specialists in the different departments of medicine and surgery; and the development in large cities of hospitals and schools, and opportunities for teaching, would seem to render them the natural repositories of accumulating experience and the sources of advancing knowledge. It is from city practice and hospital experience, therefore, that the materials for the preparation of text-books on special subjects would be naturally sought, and from these sources the substance of the present work has been mainly derived. Its object is to present to the student and general practitioner a succinct account of the nature and treatment of the diseases incident to the genito-urinary organs as they are encountered in private and hospital practice by those engaged in their daily and especial study. The literature of this department of surgery has been carefully studied with the purpose of reproducing every fact of *practical* value. It is hoped that the reader will recognize a conciseness in the grouping of these facts which will save him the necessity of reference to the numerous monographs and essays from which they have been collected.

On account of the general character of the work as a text-book, it has been impossible to refer very largely to personal authority and experience, and this has been for the most part avoided except in reference to mooted points and exceptional or noteworthy phenomena. The extent of the subject-matter treated of, and the necessity for compression, will be regarded, it is hoped, as a sufficient apology for terseness and directness of expression or defect in style, while the circumstance of joint-authorship will explain any lack of uniformity in manner throughout the work, of which the preparation for the press has devolved mainly upon the junior author.

The plan of the work is based upon an anatomical classification of the tissues and organs of which the diseases and deformities form the subjects of description. This necessitates some repetition and frequent reference to facts, cases, or illustrations already given, or to be given, in connection with other anatomical divisions of the genito-urinary tract. These references are usually made thus: (Nephralgia), (Plate XX.), (Case 45), the page not being specified, as the constant appearance of signs scattered through a page tends to confuse the reader. No difficulty need be experienced in turning to these references promptly, as the parenthetical word, case, or plate, may be found at once credited to its proper page in the general index at the end of the book, or in the index to plates, or list of cases, at its commencement.

The terms of measurement employed are uniformly English, with the exception of the centimetre and millimetre, which frequently occur in the text. These may be readily reduced to their equivalent in inches by computation from the subjoined table.[1]

The subject of syphilis is included, of necessity, in a treatise like the present. Opportunities for the observation and study of this disease on a large scale fall mainly to the share of the metropolitan hospital-surgeon and special practitioner. Although properly belonging to the department of Principles of Surgery, there is no disease falling within the limits of this work concerning which clear and correct ideas as to nature and treatment will, at the present time, so seriously influence success in practice.

Chapter VIII., Part II., "On Syphilitic Diseases of the Eye," has been kindly furnished, at the request of the authors, by Prof. H. D. Noyes, M. D., whose authority on this subject is undisputed.

They beg leave to thank Dr. Roosa for aid, both personally and through his excellent work "On Diseases of the Ear," in the preparation of Chapter IX., "On Syphilis of the Ear."

Acknowledgments are also due to Dr. Partridge and Dr. Morrison-Fiset, of the house-staff of the Charity Hospital, for kind assistance; and to Dr. L. A. Stimson for aid in many ways.

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[1] 1 centimetre = 4.433 lines, or .393708 inch;
1 millimetre = .443 " .03937 inch;
or, roughly, 1 millimetre equals half a line—about one twenty-fifth of an inch

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PART 1.

DISEASES OF THE GENITO-URINARY ORGANS.

CHAPTER I.

DISEASES OF THE PENIS.

Anatomy.—Anomalies; Double Penis; Absence of Penis.—Injuries, Fracture.—Cutaneous Affections.—Tumors.—Cancer.—Amputation of Penis.—The Prepuce; Circumcision.—Phimosis; Remote Results of Phimosis.—Paraphimosis.—The Glans Penis; Herpes Progenitalis, Balanitis, and Posthitis, Vegetations, Epithelioma.—The Corpora Cavernosa; Inflammation, Calcification, Gummy Tumor, Circumscribed Chronic Inflammation.

THE penis is a genital organ. Its urinary function is purely secondary. It is conformed anatomically to subserve the genital function. In the adult it measures, when at rest, from the root of the scrotum to the meatus urinarius, from two and a half to four inches; when erect, from five to seven inches. It consists essentially of three segments—the two corpora cavernosa, lying together like the barrels of a gun, and the corpus spongiosum—like the ramrod—beneath them—the whole surrounded by integument.

THE CORPORA CAVERNOSA arise on either side from the tuberosities and ascending rami of the ischium. They come together under the symphysis pubis, and continue side by side, forming the main bulk of the penis. They terminate anteriorly in a conical extremity, over which the glans penis (the terminal expansion of the corpus spongiosum) fits like a cap. There is no vascular communication between the tissue of the corpora cavernosa and that of the glans penis, nor with that of any part of the corpus spongiosum.

Each corpus cavernosum is surrounded by its own fibrous sheath—tunica albuginea—which, together, are so dense and strong, that they will support the weight of the cadaver without giving way.[1] The sheath is, however, plentifully supplied with elastic fibres, which allow it to accommodate itself to the variable size of the organ. The partition between the corpora cavernosa is perforated by numerous apertures, to insure thorough and symmetrical erection. The tissue proper of the corpora cavernosa is known as spongy, or erectile. Erection takes place when the areolæ of this tissue become distended with blood, as shown in Fig. 1.

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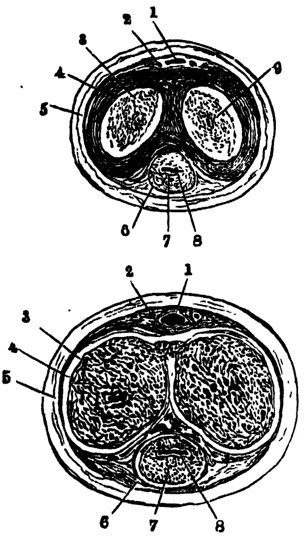
[1] Cruveilhier, "Traité d'Anatomie descriptive," Paris, 1865, vol. ii., part i., p. 386.

THE CORPUS SPONGIOSUM URETHRÆ is also composed of erectile tissue. It surrounds all that portion of the urethra lying in front of the triangular ligament, anteriorly forming the cap over the conical extremity of the united corpora cavernosa—known as glans penis—posteriorly terminating in the bulb, which lies just in front of the triangular ligament in the angle of the converging crura penis.



FIGS. 1, 2.—(*Cruveilhier.*)

TRANSVERSE SECTION OF PENIS.—Fig. 1. Flaccid; Fig. 2. In Erection; 1, 2. Dorsal Vein and Artery; 3. Erectile Tissue; 4. Tunica Albuginea; 5. Integument; 6. Tunica Albuginea of Corpus Spongiosum; 7. Erectile Tissue; 8. Urethra.

THE GLANS PENIS is covered by a semi-mucous membrane endowed with peculiar sensibility, especially around the raised posterior border—the corona glandis. The epithelium covering the glans is fine; the papillæ minute (Home); the sebaceous glands (of Tyson) large and numerous, and most plentiful about the frænum. These glands secrete the white, badly-smelling material which collects, in uncleanly persons, behind the corona. The function of the glans penis is to furnish a soft-skinned expansion for the distribution of the terminal filaments of the nerves of sexual sensibility.

One important function of the corpus spongiosum is acquired through its bulb—namely, that of assisting in the expulsion of the last drops of urine or semen from the urethra. The prostate, levator ani, and deep urethral muscles—especially the compressor urethræ—contract upon the fluid remaining in the canal after micturition, in that spasmodic effort called by the French the "coup de piston." This forces the last few drops beyond the bulb of the urethra. Now the middle fibres of the accelerator urinæ—those which surround the bulb and adjacent portions of the corpus cavernosum—contract and forcibly drive the blood, which was contained in the areolæ of the bulb, forward along the corpus spongiosum, forcibly distending that body, and thus bringing the walls of the urethra more closely into contact in a progressive wave. This helps to explain, as shown by A. Guerin,[1] why the last few drops of urine do not escape promptly, but dribble away in cases of organic stricture of any severity; for, with such a stricture, the areolæ of the erectile tissue become more or less obliterated at the constricted point, and an obstacle is formed to the free passage of the wave of blood forward along the corpus spongiosum.

The three erectile bodies which have been briefly described are surrounded by the sheath proper of the penis—a membrane important in its pathological relations, and sometimes known as Buck's fascia, from the distinguished surgeon who first accurately described it.[2] This fascia may be said to arise from the linea alba and symphysis pubis by a triangular bundle of fibres known as the suspensory ligament of the penis. The fibres spread out upon the corpora cavernosa, extend over the conical head of these two bodies, and are, at this point, firmly attached to the under surface of the glans penis, which may be removed entire with the fascia. The sheath, after encircling the corpora cavernosa, splits into two layers, to embrace and form a sheath for the corpus spongiosum. The fascia is attached behind along the rami of the pubes, and is identical with the deep layer of the superficial fascia of the perinæum, curving under the transverse muscles, and finally losing itself in the anterior layer of the triangular ligament. The cavity of this fascia is bounded anteriorly by the under surface of the glans penis, and posteriorly by the triangular ligament. Its boundaries have a practical bearing upon the burrowing of infiltrated urine. Urine may escape out of the urethra, and yet be prevented by this fascia from passing the limits above described for an indefinite time, unless Richet[3] is correct in stating that, at the root of the penis above, the fascia cannot be distinguished from that covering the pubes—that it is here loose in character—and that urine may escape at this point out of the sheath into the areolar tissue of the abdominal wall.

The lymphatics and veins of the penis run along the dorsum of the member, and receive in their course branches from the corpus spongiosum, which encircle the penis between the folds of Buck's fascia. The lymphatics lead mainly to glands lying along and above Poupart's ligament on either side. The arteries come from the internal pudics.

The connective tissue which attaches the integument of the penis to the fascia is very loose and elastic, and, like that of the eyelids, does not contain fat.

The skin of the penis, except that it tends to become pigmented after puberty, does not differ essentially from ordinary integument. Over the glans penis it folds back upon itself, forming a non-adherent sheath for the glans (the prepuce), evidently intended to preserve the delicate sensibility of this portion of the member.

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[1] "Des Rétrécissements du Canal de l'Urètre." Mém. de la Soc. de Chir., vol. iv., 1857.

[2] Trans. Am. Med. Ass., vol. i., p. 367.

[3] "Traité d'Anatomie Médico-Chirurgicale," Paris, 1873.

The Prepuce is composed of two layers, a cutaneous (external), and a more delicate semi-mucous (internal). The point of junction of these two is called the orifice of the prepuce. Between these layers is a very loose and elastic connective tissue, without fat, which allows the two surfaces to be entirely separated from each other, and the prepuce effaced, by drawing back the integument of the penis until the glans is entirely uncovered. The mucous layer of the prepuce is supplied with the glands of Tyson. It is much less elastic than the cutaneous layer.

The prepuce is attached to the lower angle of the meatus urinarius, or orifice of the urethra, by a triangular fold of mucous membrane called the frænum preputii—analogous to the frænum linguæ.

ANOMALIES OF THE PENIS.

Deformities of the penis are constituted by abnormalities in some of its constituent parts. The most common examples will be mentioned in connection with these parts. As anomalies of the penis, two conditions demand especial notice—double penis and absence of the penis. Anomalies in size occur, as when the penis is nine or ten inches long when at rest, or only a couple of inches long when erect; but these variations are very uncommon.

Double Penis is excessively rare. It is analogous to double uterus and vagina in the female, but by no means so common. Undoubtedly it is not so uncommon as the records of surgery would seem to imply, for the existence of this deformity is naturally accompanied by an excessive sensitiveness on the part of the patient which leads him to shun observation and comment; and, as the defect is not necessarily accompanied by any symptoms affecting the general health injuriously, the patient does not voluntarily subject himself to the inspection of a physician, and thus keeps himself out of the books. Case I., reported by the authors, exemplifies this fact, and chance alone allows it to be placed on record.

A case of this anomaly is reported by Mr. Ernest Hart[1] (with several plates of the patient in different positions), in the person of a well-formed, healthy man, the victim of a monstrosity by fœtal inclusion. Between his thighs there grew a third thigh, terminating in a leg and double foot, all small and deformed. In front of this thigh there was a shrunken, empty scrotum, bordered on either side by a well-developed scrotum, each containing one testicle. The penis was double, each organ being well formed and perfectly developed. They were both in proper position, each measuring four and a half inches when pendant, being larger than normal. The left was the larger in circumference, and appeared to have become so by being used in preference to the other. Both became erect at the same time under excitement. The urine or the semen, as the case might be, was discharged simultaneously by both organs.

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[1] *London Lancet*, January, 1866, p. 71.

The following (personal) case is more strictly typical of double penis, since it shows no evidence of so-called fœtal inclusion:

Case I.—In 1873, a stout, healthy-looking man, of forty-two, applied for advice as to what form of truss he should wear for a rupture. A portion of integument some three inches in diameter, cicatricial in aspect, situated in the median line, just below the umbilicus, and not protruding noticeably as he lay on his back, was pointed out by the patient as the seat of rupture. There was distinct prominence of this portion of the abdominal wall in the upright position, increased on effort, by coughing, etc. The difficulty was congenital and caused but slight inconvenience. The general appearance of the deformity suggesting extrophy of the bladder, an attempt was at once made to expose the genitals, which the patient had thus far kept scrupulously covered by his clothing. This movement the patient resisted, insisting that he desired advice about his rupture only, and was unwilling to expose himself further. After overcoming his reluctance, the genital organs were uncovered, revealing two distinct male organs of normal size, and apparently well formed, lying side by side, each attached by its root to the pubic symphysis. Each penis was well developed, the right rather the larger of the two. Their integumental covering was common up to the base of the glans; here each was entirely distinct and perfect as to external appearance, but the meatus of the left glans was impervious. The right meatus was normal, and the patient stated that his urine passed through this opening mostly, some always escaping from a point behind in the perinæum. Here, just where the root of the scrotum should have been attached, was seen, on lifting the double-barreled penis, the orifice of a canal, lined by healthy mucous membrane, and large enough to admit the finger, funnel-shaped, and, in general appearance, recalling the ostium vaginæ of a child. What proportion of the urine passed through this orifice the patient could not state, but he was compelled always to let down his trousers and sit, when he made water. On the right side of this orifice was an elongated, rounded prominence, recalling in its outline the labium majus. This contained a testicle, normal in shape and sensibility, and but slightly under-sized, surrounded, as was evident from its mobility, by a tunica vaginalis. The left testis lay over the tendon of origin of the adductor longus in the left groin. It was not fully developed. There was no prominence on the left side of the perinæum. The patient had sexual desires, erections, and emissions. Both penes became simultaneously erect, the right more vigorously. The sexual propensity seemed rather deficient. There was a feminine breadth about the pelvis. The mammillæ were normal. There had never been any periodical phenomenon of the nature of menstruation. The left lower limb was several inches shorter and smaller than the right. This was congenital. Health had always been unusually good. The patient left with an unsolicited promise to return—a promise which he failed to keep. There was great difficulty in getting at any of the facts of the case, on account of the *mauvaise honte* of the patient.

Absence of the Penis.—A case of congenital absence of the penis has been observed by Nélaton.[1] The scrotum was well developed, and contained testicles. The child urinated through the rectum. Another similar case has been reported by Goschler.[2]

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[1] *Gaz. des Hôp.*, 28, Jan., 1854.

"Vierteljahrschrift für practische Heilkunde," Prag, part iii., 1857.

ACCIDENTS TO THE PENIS AS A WHOLE.

Contusions.—The escape of blood under the skin in superficial contusions of the penis is often excessive, on account of the laxity of the connective tissue, and the large size of the superficial veins. Deeper contusions give rise to localized swelling from circumscribed effusion of blood, which fluctuates, increases in size on erection, and may cause the penis to deviate more or less from its normal aspect. Opening into such a collection of fluid is not to be thought of, as it might give rise to suppurative inflammation. If the contusion be severe enough, inflammation of the corpora cavernosa results, ending in suppuration or gangrene. Severe contusions involving the urethra may lead to infiltration of urine, and loss of substance, with urethral fistula.

Treatment of contusion consists in combating inflammation, employing cold, evaporating, astringent lotions; later, perhaps, compression, and in giving the absorbents time to remove the effusion.

Wounds.—The penis is liable to be wounded by accident or design. In the latter case insanity, or the melancholy depression often attending the loss of self-respect produced by masturbation, is apt to be at fault, and to induce the patient to mutilate himself: or, the injury may be inflicted by a woman, jealousy being the motive.

Superficial cuts are unimportant; but wounds extending within the sheaths of the corpora cavernosa may give rise to troublesome, possibly fatal hæmorrhage, while the cicatrices left on healing may distort the penis, and render erection imperfect and painful.

Treatment.—Clean the wound. If a large artery is spirting, tie it, but let the oozing points alone. Join the edges as accurately as possible, with points of fine suture not introduced deeper than through the fibrous sheath. Employ moderate pressure in dressing. Erections, which are sure to occur since the local inflammation induces an afflux of blood, always retard healing.

(For injuries involving the urethra, refer to diseases of that canal.)

FRACTURE OF THE PENIS.

When the fibrous sheaths of the corpora cavernosa are ruptured by sudden forcible flexion of the erect penis, a sort of fracture of the member is produced, with extensive extravasation of blood—sometimes amounting to traumatic aneurism. The late Valentine Mott[1] reported two interesting cases of this accident, where the only treatment employed was rest and cold locally. Both cases recovered, with a useful organ and no deformity.

Treatment.—A silver or stout woven, elastic catheter, strong enough to resist lateral compression, is first passed into the bladder to insure right of way to the urine. Over this the penis is firmly compressed by adhesive straps or collodion, or both, and cold applied locally. Pitha[1] states that, if speedy relief be not afforded, the tension of the blood, effused in great excess, may bring on rupture of the sheath of the penis, or gangrene, demanding amputation.

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[1] Transactions of the New York Academy of Medicine, vol. i., part i., 1851.

As a rule, patients recover more or less perfectly. A lumpiness may be left behind at the point of injury (nodes or ganglia of the corpus cavernosum) which makes erection imperfect and painful, and interferes with sexual intercourse. No attempt has yet been made to relieve this latter condition, when following fracture.

The only other form of fracture to which the penis is liable is, rupture of the inflamed corpus spongiosum urethræ.

When this erectile body is inflamed, as it often is in gonorrhœa, a painful curving downward of the penis during erection is the result, and there exists a vulgar superstition that, if this chordee be "broken," the gonorrhœa will get well. A patient breaks his chordee by violently straightening the organ, when it is erect. The result is a free flow of blood from the urethra, and, after a time, inevitably, traumatic stricture.

That rupture of the healthy corpus spongiosum may occur is shown by the following case:

Case II.—A middle-aged Irishman, attempting intercourse while intoxicated, sustained a rupture of the corpus spongiosum urethræ, which led to abscess, urinary fistula, and subsequent traumatic stricture. The patient had no gonorrhœa, stricture, or other lesion of the urethra, or of the corpus spongiosum, before the accident.

CUTANEOUS AFFECTIONS OF THE PENIS.

The integument of the penis may be the seat of most of the ordinary cutaneous affections, which present no very special peculiarities in this situation. Venereal sores and eruptions will be described in their proper place. Elephantiasis usually involves the scrotum primarily. In phlegmonous erysipelas of the penis, free incisions should be made early, to prevent gangrene and save the organ from becoming denuded. Lymphangitis may complicate a variety of inflammatory lesions. It will be described in connection with its most common causes—chancre and chancroid. The following case illustrates a peculiar and rare affection of the lymphatics:

Case III.—A middle-aged man presented himself with a painless, compressible swelling behind the corona glandis, partially encircling the penis, with one thickened cord-like lymphatic, extending from it along the dorsum of the penis to its root. The condition was chronic, and did not interfere with the function of the organ. Its origin was idiopathic, and unconnected with inflammation.

TUMORS OF THE PENIS.

Fatty, fibrous, cystic, erectile, and other tumors, are occasionally, but very rarely, found on the penis. Their removal is a question of judgment involving a recognition of the function of the penis as an intromittent organ, and the possible loss of this function, from the formation of cicatrix.

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[1] "Krankheiten der männlichen Geschlechtsorgane," Erlangen, 1864. Virchow Hdbch. d. sp. Path. und Ther., p. 18.

CANCER of the penis, except epithelioma, described under diseases of the glans penis, is exceedingly rare. The medullary variety is sometimes seen, especially in boys, following injury of the part. It grows rapidly in a lobular form, unequally in the corpora cavernosa. It involves the glans, and sprouts out under the prepuce. The veins of the penis become larger and tortuous. The distention of the common fibrous sheath of the penis, by the rapid growth of the new formation within it, may compress the urethra, and make retention of urine imminent, calling for external perinæal urethrotomy to relieve the bladder, as occurred in the case of a boy under the charge of Dr. Weir, at St. Luke's Hospital, in this city. The pain of this form of cancer is severe. Some of the bulging prominences along the penis are very soft, and give a fallacious impression of fluctuation, which is very marked. Local heat is increased, and, as the disease may develop not long after injury to the part, the question of suppuration of the corpora cavernosa may present itself to the young surgeon. The inguinal glands soon become involved, the patient emaciates rapidly and dies.

Prognosis is the worst, and amputation, the only resource, is not to be thought of, unless the growth be very recent, and involve only the fore part of the member. Relapse would even in such cases be almost inevitable.

AMPUTATION OF THE PENIS.

In amputating the penis, as much of the organ should be spared as possible. If it is divided too near the root, it will retract behind the symphysis, unless care be taken to prevent it, and render it difficult to control hæmorrhage. Therefore, where the section must be low, a stout ligature may be passed behind the proposed limit of operation, through some part of the sheath of the penis, as a preliminary step, before cutting into the corpora cavernosa.

When the amputation is made near the suspensory ligament, the patient can no longer throw a stream of urine forward, and the habitual use of the catheter may be required to prevent soiling the clothes.

The steps of the operation are as follows: The skin should be incised at a point somewhat lower than it is desired to divide the body of the penis, as the latter shrinks after section. The corpora cavernosa should be severed with one stroke of the knife. The hæmorrhage is free, and many spirting points will require ligature. The arteries are liable to retract into the tissue of the corpora cavernosa, and the forceps must be slender-pointed and grasp well to seize them. Sometimes they cannot be pulled out. Pressure and cold will arrest oozing, but some persulphate of iron should be at hand to be used if necessary. If there is tissue enough, the urethra should be divided about half an inch in front of the point of proposed section, as the first step of the operation after dividing the skin. When all bleeding has been quieted, the urethra is slit into two equal lateral flaps, and these united by many points of fine suture to the skin, over the corpus spongiosum, on either side. In case there is not enough tissue to spare, the expedient of Mr. Teale[1] may be resorted to, which consists in slitting the under surface of the urethra after amputation, to the extent of about two-thirds of an inch, and uniting the mucous membrane to the skin on each side of the slit by suture. If the urethra is not especially attended to, stricture of a very serious character is sure to follow cicatrization. If the precaution has been omitted at the time of operating, and stricture has resulted, it may be dealt with subsequently by Teale's method.

Galvano-cautery may be employed in amputation of the penis or the *écraseur* of Chassaignac, or Maisonneuve's modification with a stout wire, and the urethra treated by Teale's method. After the *écraseur*, however, sharp bleeding will sometimes come on in a few hours. As a rule, each of these latter methods is comparatively bloodless, but after any operation there may be recurrent hæmorrhage shortly, accompanied by a tendency to erection. Properly-applied pressure will arrest it.

THE PREPUCE.

DEFORMITIES.—Practically, the deformities of the foreskin (phimosis and atresia of the orifice excepted) are unimportant. The prepuce is sometimes bifid, enlarged into a pouch, redundant, projecting half an inch or more beyond the apex of the glans, or only rudimentary from arrest of development. Between the two latter limits it may be of any length, covering more or less of the glans. When the prepuce is deficient, the epithelium of the uncovered glans penis becomes hard and tough, more nearly resembling ordinary cuticle. Under these circumstances the sensibility of the part is diminished, but, at the same time, it is rendered less liable to become excoriated or to take on inflammation. Hence, absence of the prepuce is not to be regretted, and the operation for its restoral, postheoplasty, need not be touched upon. Dieffenbach performed it once on account of neuralgia of the glans penis.

Excessive length of the prepuce may demand operative interference. Moderate length alone, however, can hardly be said to constitute a defect, and may be left unmolested unless complicated by induration, thickening, or a contracted preputial orifice (phimosis), or, unless it becomes troublesome, by getting constantly inflamed, or occasions and keeps up balanitis. Great length of the prepuce is sometimes the result of constant traction, as in children with stone.

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[1] *Medical Times and Gazette*, vol. xix., p. 354.

OPERATIONS ON THE PREPUCE.

CIRCUMCISION.—This operation consists in cutting off a portion of the prepuce, including its orifice. According to the chronologists of the Bible, circumcision was instituted as a religious rite by Abraham in the year of the world 2059—nineteen hundred and forty-one years before Christ. Several of the Eastern nations still practise it as a hygienic measure. The chosen people, however, preserve the custom as a religious ceremony, performing it on the eighth day.

Perhaps no operation in surgery has been performed after so many different methods as this simple one of amputation of the prepuce. The indication is to remove the orifice of the prepuce and all redundant tissue and to insure looseness of what is left. This is best accomplished as follows:

If phimosis exists, first insert a well-oiled probe into the *cul-de-sac* of the prepuce, and with it sweep the whole surface of the glans to detect adhesions and break them up, if they are not too firm. Next, seize the orifice of the prepuce at opposite points of its circumference (or at the end of the raphe, if there is atresia) with the fingers, if it is long enough; otherwise with sharp-toothed forceps, drawing the whole forward until the mucous layer is put well upon the stretch. Now grasp the prepuce firmly, just in front of the apex of the glans penis, with a pair of long, narrow-bladed forceps (Fig. 3). Make sure, by moving the glans from side to side, that its apex is not caught by the forceps, and cut away with scissors, curved on the flat, all that portion of the prepuce lying in front of the instrument. If a knife is used, transfix the flap in front of the forceps and cut both ways from the raw edge out.

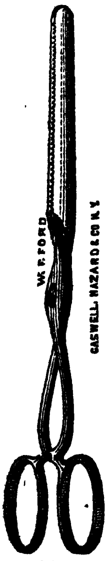

FIG. 3.—Ricord's Forceps, latest pattern, not fenestrated.—Collin & Co.

In performing this operation, it is important to seize the orifice of the prepuce. The young practitioner, if not forewarned on this point, will invariably catch the prepuce over the glans in his fingers and pull the loose skin forward, sliding it on itself, until he thinks he has obtained enough redundant tissue to cut off, and will then apply his forceps according to rule, and cut. He will be surprised, however, on removing the forceps, to find the preputial orifice intact, with a breadth of perhaps a quarter of an inch of the cuticular layer still attached to it, and to discover that he has removed from the penis a belt of skin behind this point. If the preputial orifice itself be seized, there is no fear of too great traction, for the mucous membrane is attached behind the corona glandis, and is, moreover, less elastic than the cutaneous layer. If strong adhesions exist between the prepuce and the glans, it may be necessary, in order to remove enough tissue, to make traction from a point a little outside of the orifice of the prepuce. In such cases it is well to mark beforehand, with ink or iodine, the limit of skin which it is proposed to remove, and, placing the forceps just behind this mark, to cut away what lies in front of it.

After the redundant tissue has been removed, what is left of the mucous layer of the prepuce will still encircle the glans, the skin of the penis retracting, by its elasticity, behind the corona. In the adult this mucous layer should be cut down to the corona along the dorsum of the glans. In infants it is as well to tear it to the same point. If adhesions exist, as they often do in children, the mucous layer may be readily peeled off on either side with the thumb-nail. The knife will rarely be required.

The square edges of the mucous membrane are now to be trimmed off slightly with scissors, and pressure applied until the bleeding has ceased. The hæmorrhage is usually unimportant, except from the artery of the frænum if severed. This may be arrested by torsion or ligature.

A most important point, not generally mentioned in descriptions of this operation, is the necessity of thoroughly relieving all tightness, wherever situated. Removing all the prepuce is not essential, but whatever is left must be loose: otherwise, after a slow recovery from his operation, the patient still finds himself with a tight, possibly still phimosed, prepuce. The cause of this failure of the operation is the mistaken idea that the stricture lies solely in the mucous membrane, and that the skin, being elastic, will stretch. Theoretically true, this conclusion is practically inaccurate. The raw edge of the cuticle may slip quite readily over the glans penis after operation, but, if it be in the least degree snug, it exposes the patient to two dangers, namely:

1. Erections stretch the small circle, pull the edges asunder, put the sutures on the stretch, and greatly interfere with quick union. This need never happen. If the operation has been properly performed, it is entirely unimportant how many erections occur, healing goes on just as rapidly, for the adjustment of the edges of the wound is not interfered with.

2. The cut cuticular surface contracts on healing, and, if some of the prepuce has been purposely left, at the patient's request, the new orifice is perhaps so tight as to be unable to pass over the corona during erection.

Both of these inconveniences are readily obviated by making two incisions (perhaps a quarter of an inch long in the adult), one along the raphe, and the other along the dorsum, of the penis, and slightly rounding off the four square corners. This gives ample room in all cases. In babies this modification of the operation is not called for.

The wound in the infant is dressed by simply laying the raw surfaces in contact, and retaining them there by the application of a square piece of old linen, smeared with cold cream, with a hole in its centre just large enough to allow the glans penis to pass through. This is to be folded back over the penis, tied loosely with thread, and the whole retained by a T-bandage. Union occurs in about forty-eight hours.

In dressing the adult penis, it is well to use a great number of very fine silk sutures, turning back the mucous layer of the prepuce like a cuff and uniting it with the raw edge of the cuticle. In applying these sutures, the first one must be placed at the raphe, uniting it with the stump of the frænum to insure symmetrical adjustment. Silver wire is clumsy: Vidal's *serres-fines* are unsatisfactory. The adult patient should in every case be confined to his bed until union has taken place. Simple water-dressing, with a little glycerine to prevent the old linen from sticking, is all that is usually required. There is no necessity of giving any medicine to prevent erection. Nothing short of opiates can be relied upon to do it, and, if the incisions have been properly made, erections do not seem to interfere with healing in the least degree.

This operation always gives a satisfactory result, unless it has been performed during the existence of inflammatory or specific disease affecting the prepuce, in which case the cicatrix may require subsequent attention The adult patient can usually leave his bed after five or six days, but it is a saving of much trouble in the end to keep him absolutely confined until the greater part of the wound has healed pretty firmly—a period rarely exceeding ten days if the patient is manageable. If the sutures have been applied accurately, and the patient is reasonably healthy, union by first intention may be counted on over at least three-fourths of the wound, perhaps all of it. The longer the sutures are allowed to remain the better. Until suppuration commences around them they do no harm. Alternate ones may be removed from day to day till all are taken out. The main obstacle to getting a speedily successful result lies in the difficulty of inducing the patient to keep quiet for so trifling a wound. Motion before sound union has taken place may open the whole wound and keep it œdematous, inflamed, and suppurating, for weeks. It is unwise ever to undertake to operate on the adult without an anæsthetic.

A good deal of œdema sometimes occurs along the under surface of the penis, to prevent which it is advisable to keep the member elevated from the first. When, from lack of vitality or other cause, a portion of the wound granulates, it may be dressed with any mild stimulating lotion—one part of aromatic wine to three of water, and hygiene, with change of air, be brought to bear upon the case. In these cases the patient often desponds at the appearance of the wound, but the ultimate result is invariably satisfactory.

THE OTHER OPERATIONS for overcoming tightness require but slight mention. A very common and sufficiently good operation, where the prepuce is tight but not redundant, consists in making one incision along the dorsum of the prepuce, including both layers, from the orifice to the base of the corona, and uniting the two layers of prepuce on either side. It is better to trim off the corners. Several partial incisions at different points have been advocated.

Another method consists in nicking the mucous membrane at the orifice, pulling the prepuce back, until the orifice again becomes tight, and then nicking again, and so on, until the mucous layer is sufficiently loose to glide easily over the corona. Again, where the prepuce can be retracted when the penis is not erect, the mucous membrane alone has been divided upon a director; the prepuce being pulled back and the cut made along the dorsum of the penis, from just behind the corona to the junction of mucous membrane with skin. The longitudinal incision is to be united transversely. Both these operations will yield imperfect results unless the skin be very loose, and the entire stricture situated in the mucous membrane, which is not always the case.

The frænum may be too short and require division—readily effected with a sharp-pointed bistoury, the artery being twisted or tied.

Compressed sponge (Monteggia) and laminaria digitata have been used to distend a tight preputial orifice, but the cases where this treatment yields any thing more than temporary relief must be few. Forcible dilatation[1] has been employed by Nélaton, Cruise,[2] of Dublin, and others, and favorable reports rendered. A two or three bladed forceps, made expressly for the purpose, is inserted closed into a tight preputial orifice, the desired amount of dilatation being first decided upon, and then, by suddenly separating the blades of the instrument, dilatation (perhaps more properly divulsion) is effected. The prepuce is now retracted and held behind the corona for from twenty-four to forty-eight hours, water-dressing only employed. This treatment might be useful in some cases, but the application of circumcision is universal.

MORBID CONDITIONS OF THE PREPUCE.

Phimosis (φιμόω, *I bind*) exists where the orifice of the prepuce is so small that the glans penis cannot be uncovered. The orifice of the prepuce may be congenitally absent (atresia preputii). Phimosis is congenital or acquired, simple or inflammatory, or complicated by other diseases or by adhesions.

With very young children, phimosis is so common that it may be considered normal. The foreskin of a child is developed out of all proportion to the rest of the penis, taking the member after puberty as a standard of comparison. This long prepuce is often a source of anxiety to young mothers, who fear that the condition may remain permanent. They may be assured that it will right itself as the child grows. Whenever the prepuce can be retracted sufficiently to allow the glans to be seen, there need be no anxiety about the future; the preputial orifice will enlarge sufficiently before or at puberty. This anxiety is similar to that of mothers about short frænum linguæ.

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[1] Known as Nélaton's operation, *Gaz. des Hôp.*, 31, 1868.

[2] *Dublin Quarterly*, xlviii., p. 482.

A positive indication for operation, in the case of a child, does exist, however, where the preputial orifice is smaller than that of the urethra. This condition is known to exist when the prepuce "balloons" during micturition, for the urine flows into its cavity more rapidly than it can escape from its orifice. In these cases the retention of a drop or two of urine in the cavity of the prepuce, after each act of urination, must, sooner or later, lead to inflammation of one or both of the mucous surfaces, and may give rise to severe suppurative inflammation, the growth of vegetations, adhesions of the prepuce to the glans, formation of preputial stone, or incrustation of glans. When, therefore, the prepuce of an infant "balloons" during micturition, phimosis exists, and circumcision should be performed.

When the prepuce is too tight in the adult, an operation may be called for as a prophylactic against future disease, although phimosis, strictly speaking, does not exist. In such a case it is difficult for the patient to observe perfect cleanliness, and the collection of smegma, or an attack of herpes, may give rise to an inflammation which will necessitate an operation under unfavorable circumstances. Again, if an individual with tight prepuce gets chancre, chancroid, gonorrhœa, serious inflammatory complications are liable to arise.

Phimosis may be brought about secondarily through induration and inelasticity of the skin, caused by frequent attacks of preputial inflammation. When such inflammation is prolonged in the chronic state, the meshes of the connective tissue, at first distended with serum, become secondarily thickened and hypertrophied, sometimes to an extent almost worthy of the name of elephantiasis. The serum is absorbed and its place supplied by a hyperplasia of connective tissue, leaving a thick, long, indurated, inelastic prepuce, interfering not only with sexual intercourse, but sometimes even with urination. Circumcision is the proper remedy.

Another common cause of acquired phimosis is the existence of multiple chancroid around the orifice of the prepuce, which, on healing, leave hard cicatrices behind, contracting the preputial orifice perhaps to phimosis.

INFLAMMATORY PHIMOSIS is a transient condition. It may leave true phimosis behind, as above detailed, but usually does not. Any variety of phimosis may be complicated by inflammation. It is better not to circumcise when the prepuce is inflamed, if it can be avoided, as the process of repair would be retarded, and an ugly cicatrix may result. If the inflammation is caused by chancroid, this rule should be particularly observed, when possible, for the edges of the wound become inoculated in spite of every precaution. Where inflammation is slight, but œdema excessive, phimosis ensues (lymphitis). Here position and pressure with collodion, and perhaps puncture on each side of the frænum, are indicated.

Treatment of Inflammatory Phimosis.—Keep the patient in bed, and elevate the penis over the hypogastrium. Evaporating lotions may be used locally, containing a little spirit or a (gr. x.–xx.) solution of tannin, frequently washing out the cavity of the prepuce by means of a syringe with a flat nozzle, with some mildly-stimulating lotion, such as dilute lead-water or carbolic acid (gr. ij to the ℥ j), Labarraque's solution (ʒ ss. to the ℥ j).

Remote Results of Phimosis.—Besides predisposing to local inflammatory disorders, leading to imperfect development of the glans penis, and acting as an obstacle to sexual intercourse, phimosis may occasion a variety of morbid conditions by reflex action. L'Allemand enumerates it among the causes of spermatorrhœa. It may occasion frequent desire to urinate (irritability of the bladder)—finally cystitis. The following case is in point:

Case IV.—An anæmic boy of seventeen came to seek advice for a constant desire to urinate, to which he was obliged to yield every hour, and which had troubled him for several months. He had never had sexual intercourse, or any disease of the sexual or urinary organs. He was not awakened at night. The urine was examined and found normal —proving entire absence of cystitis. The prepuce was tight, its orifice small, and the glans penis so sensitive as to be painful when touched. Iron and quinine for two weeks produced no change. Circumcision was then performed. Frequency of urination commenced to subside two weeks after the operation, and in one month the patient reported, to say that he made water only three or four times daily, and between the acts had none of the old uneasiness. Six years have passed with no recurrence of trouble.

Dr. Sayre, of New York, has published several cases of relaxation of the muscles of the back with curvature of the spine in children, caused by phimosis with adhesions, the local irritation being so great as to keep the little patient in a condition of almost constant priapism. Prolapsus ani not unfrequently accompanies phimosis in children when the prepuce becomes inflamed, and symptoms resembling those of stone in the bladder are not uncommon from the same cause.

Paraphimosis (*παρὰ, outside; φιμόω, I bind*) exists where the prepuce gets behind the corona glandis and cannot be replaced.

Causes.—An unnaturally tight preputial orifice is a predisposing cause to paraphimosis. It sometimes happens that young boys, who retract the prepuce, perhaps for the first time, find themselves unable to replace it. Instances are reported where rings of metal have been forced upon the penis, retracting the prepuce. The glans penis now becoming a little turgid, the patient is unable to remove the ring. Shame deters him from seeking relief at once, and the ring is only found during an operation, after days or weeks of suffering, buried deep in the swollen, œdematous, perhaps gangrenous penis.

Inflammatory paraphimosis may depend upon balanitis, gonorrhœa, herpes, chancroid, chancre, etc. The prepuce, already a little inflamed, is retracted, to see or dress some ulceration concealed in its *cul-de-sac*, or is, perhaps, held back by bandage for convenience of dressing, or, if short, becoming inflamed and œdematous, it may roll itself back. It soon inflames further, œdema increases, and reduction becomes impossible.

Symptoms.—In paraphimosis the glans penis is swollen and livid. If the patient is seen at once, there may be no inflammation, either of the prepuce or the glans; but, in many cases—in all eventually, if unrelieved—both are inflamed to a greater or less extent, the glans perhaps being gangrenous from arrest of circulation. Behind the corona, most marked below, rises a tense, shining, œdematous belt of the mucous layer of the prepuce, the connective tissue of which is filled with serum. Behind this there is a deep sulcus or furrow, most marked above, often the seat of superficial ulceration. Here lies the stricture; behind it there rises another œdematous fold, usually smaller than the one in front.

If the stricture of the prepuce is tight enough to arrest the circulation, it may finally cause the destruction, by gangrene, of all tissues lying in front of it.

Treatment.—The first point to decide in a case of paraphimosis is in regard to strangulation. If it exist, delay is inadmissible; if not, temporizing expedients may be resorted to, to reduce inflammation, before appealing to forcible reduction or operation. The test is simple. In strangulation the glans penis is turgid, swollen, blue-black, cold, devoid of sensibility, and perhaps shows already points of commencing gangrene. If there be no strangulation, the glans may be normal, or, if swollen, is red—at least not black—warm, and by compression the blood may be driven out of it: sensibility is also preserved. A paraphimosed glans penis may be inflamed, but still not strangulated.

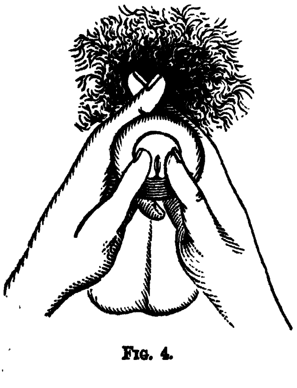
FIG. 4.

PARAPHIMOSIS WITH STRANGULATION.—In these cases ether should always be administered. Often under the relaxation of anæsthesia reduction is accomplished with comparative ease. Ice should be first used locally to produce shrinkage, and a few small punctures may be made to let out serum from the ridge in front of the stricture, if the swelling be excessive. The following are the best methods of reduction: Seize the penis behind the strictured prepuce in the fork of the index and middle finger of both hands, one placed on either side. This gives more even pressure forward than when one hand only is used. Now make pressure with the thumbs on both sides, in such a direction as to compress the glans laterally, rather than from before backward; and at the same time pull the strictured portion of the prepuce forward, the idea being to make the glans as small as possible by compression, and rather to pull the stricture over the glans than to push the glans through the stricture. The latter attempt is liable to do more harm than good, by flattening out the glans over the stricture, and rendering reduction less possible than before. The corona and a little of the mucous layer of the prepuce beyond should be slightly oiled, and an attempt may be made to insinuate the edge of the thumb-nail under the stricture to assist in lifting it over the corona.

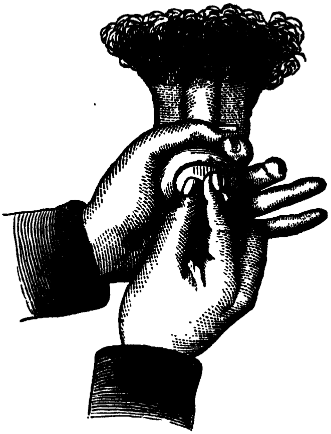
FIG. 5.—(*Phillips.*)

In some cases it is preferable to encircle the penis with one hand, using the other for manipulation. Finally, Mercier's method might be tried. The surgeon stands on the patient's right, places the index and middle finger of his right hand longitudinally along the lower surface of the penis, and the pulp of his thumb on the dorsum of the glans penis and the œdematous ridge in front of the point of stricture. By firm pressure crowding down the swollen mucous layer of the prepuce, he endeavors to insinuate the end of the thumb-nail under the stricture. If he succeeds in this, grasping the penis and the two fingers of the right hand beneath in a circular manner with the left hand, he draws the strictured point up over the thumb-nail, and by simultaneous traction of both hands replaces the prepuce. In all these operations, time, patience, and gentle firmness, will accomplish more than force.

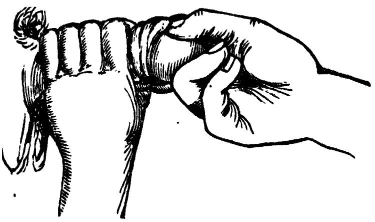
FIG. 6.

If a prolonged, careful attempt at reduction fails, the strictured point must be divided. To accomplish this subcutaneously, a tenotomy-knife is introduced flatwise along the sheath of the penis under the stricture, and is made to cut outward, until all tension is relieved. Instead of this, a simple incision may be made through the skin down to the sheath of the penis. Inflammatory consolidation of tissue may make it necessary to divide the stricture at several points.

After reduction, the treatment consists in position, rest, and cleanliness, syringing the preputial cavity with warm water holding a small amount of disinfectant, or mild astringent, in solution. If any contagious ulcer has been the cause of paraphimosis, the surgeon should carefully examine his fingers for cracks or fissures before commencing manipulation. So much handling is required that infection is very apt to occur unless the epidermis of the hands is sound.

In Paraphimosis without Strangulation, if the case is recent, reduction must be effected or inflammation will surely set in and complicate the situation. Reduction may be accomplished as detailed above, or by the method successfully employed in the Children's Hospital at Pesth.[1] Here the penis, prepuce, and glans, are together subjected to strong, continued pressure. Several narrow strips of adhesive plaster are applied longitudinally from the middle of the penis, over the apex of the glans, to the middle of the penis opposite the starting-point. The meatus urinarius is left uncovered. In this way the organ is surrounded and compressed by longitudinal strips. Over these, commencing just behind the orifice of the urethra, a narrow strip of plaster is wound spirally, using pretty firm pressure, until the penis is covered by its circular bandage up to the middle. The application is not painful. In twenty-four hours reduction may be accomplished; if not, the dressing is to be reapplied, and another attempt at reduction made in forty-eight hours.

In old or anæmic patients, having gonorrhœa or an ulcer about the head of the penis, accompanied by lymphitis, and where the prepuce is short, a large amount of serum may collect in the prepuce, roll it back, and render paraphimosis imminent. The best treatment here is a little rest, with elevation of the penis and application of a twenty-grain solution of tannin, followed by free use of collodion as soon as the patient rises. Unlike the scrotum, the prepuce bears collodion well.

In the majority of cases, when complicating chancroid, herpetic, or other ulceration, paraphimosis is purely the result of inflammation and œdema, and there is no strangulation. Here the main inflammatory condition must be treated, aided by position, pressure, puncture, evaporating and astringent lotions. These will usually be sufficient, but in severe cases a sharp watch should be kept up for any evidences of commencing strangulation. Should it occur, the point of stricture must be straightway relieved. (For other diseases of the prepuce, posthitis, herpes, vegetations, cancer, etc., refer to diseases of glans penis.)

DISEASES OF THE GLANS PENIS.

Herpes Progenitalis.—This affection consists in the development of clusters of vesicles upon reddened patches on the mucous covering of the glans or on either layer of the prepuce—occasionally on other portions of the neighboring skin—attended by a slight sensation of heat and tingling. When occurring only on the cuticular layer, herpes runs its course as it does elsewhere on the body; but, when vesicles develop within the preputial orifice, the eruption is modified. Under these circumstances the epithelium of the vesicles gets soaked off, little exulcerations result, more or less general inflammation is apt to arise from retention of the secretions, and balanitis, with posthitis, vegetations, and inflammatory phimosis, may be the ultimate result. In broken-down constitutions the ulcerations perhaps become deep and angry, diagnosis with chancroid difficult, while the glands in one or both groins may inflame and suppurate. These extreme results are rare.

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[1] Schmidt's *Jahrbücher*, and Bumstead on "Venereal," p. 122, 1870.

When the affection has once occurred, it shows a marked tendency to return. There is often a periodicity about the attacks. Tight prepuce and contact of irritating discharges act as predisposing causes.

Diagnosis.—Vesicles, usually in groups, always precede the ulcerations, while the latter are irregular in shape, superficial, and very rarely complicated by suppurating bubo. The pus is not auto-inoculable. Attention to these points will generally render diagnosis with chancroid easy; where grave doubts exist, auto-inoculation is the proper test.

Treatment is the same as for balanitis.

BALANITIS (*βάλανος, a gland*) is an inflammation of the surface of the glans penis. Posthitis (*ποσθη, the prepuce*) is an inflammation of the prepuce, chiefly affecting its internal surface. Neither can exist for any length of time without becoming more or less complicated by the other. For practical purposes they must be considered together.

Causes.—Persons of irritable skin and gouty habit are predisposed to this disorder. A long and tight prepuce is always a predisposing cause. The exciting causes are mechanical irritation or uncleanliness from retention of smegma preputii (a white, curdy substance composed of epithelial cells in fatty degeneration and sebaceous matter), or from prolonged contact with gonorrhœal, leucorrhœal, menstrual, or other irritating fluids.

Symptoms.—The membrane at first becomes reddened, then mottled and moist; next the epithelium comes off in patches, leaving irregular excoriations, which soon ulcerate and discharge a purulent fluid of greater or less consistence. These ulcerations are not preceded by vesicles. There are a burning soreness and itching at the end of the penis, usually scalding on urination. The whole substance of the prepuce may inflame, become intensely reddened around the orifice, and infiltrated with serum, producing inflammatory phimosis, especially if the prepuce is naturally long or tight. The ulcerations rarely become deep, and the inguinal glands do not often suppurate. They frequently become somewhat large and tender. In chronic balanitis with phimosis, the mucous surface of the prepuce is found upon exposure to be covered with granular prominences. Warty growths are not infrequent. Balanitis is very apt to recur.

Diagnosis.—Balanitis may be confounded with herpes, chancroid, chancre, or gonorrhœa. At the ulcerative stage it cannot be distinguished from balanitis supervening upon herpes. In the early stage its vesicular origin distinguishes it. Chancre is usually single and indurated. In chancroid the ulcerations are deeper and the pus auto-inoculable, yet both of these specific ulcers may be complicated by balanitis. Balanitis has been described under the name of external gonorrhœa. It may be mistaken for actual gonorrhœa, if there is phimosis, under which circumstance it is very apt to complicate the main malady. When the meatus urinarius can be seen, however, a little care will easily decide whether the pus comes from the urethra or not.

Treatment.—If the prepuce can be retracted, simple balanitis may be speedily relieved. Cleanliness is of the first importance, but soap should not be used. Warm water with a disinfectant, if needed, will remove all the discharges. After washing, the parts should be dried by gently touching them with a soft cloth, and dusted with a mixture of finely-powdered calomel and calcined magnesia, or with calomel alone. If the ulcerations are deep, iodoform is preferable. A piece of lint or old linen, cut so as to be just large enough to cover the surface of the glans, is now to be moistened in one of the following lotions:

	℞. Vin. aromat.,	ʒ ij–℥ ss.
	Aquæ,	℥ j.
Or,		
	℞. Pulv. opii,	ʒ j.
	Dissolve in six ounces of boiling water, and add	
	Liq. plumbi subacetat.,	ʒ j.
	Filter and cool.	
Or,		
	℞. Aluminis exust.,	gr. v–x.
	Aquæ,	℥ j.
Or,		
	Simple dilute lead-water.	

The linen so moistened is laid around the glans, leaving the apex and meatus uncovered; and, finally, the prepuce is pulled forward to its natural position. In this way friction between the inflamed surfaces is avoided, all the discharges are absorbed, and a mildly stimulating fluid is kept in constant contact with the ulcerated or abraded surfaces. The dressing should be repeated twice to four times daily, according to the amount of discharge.

If the prepuce cannot be retracted, its *cul-de-sac* should be thoroughly washed out with tepid water, by means of a syringe with a flat nozzle, if possible, every two or three hours, according to the rapidity of the formation of pus; and, each time after the cavity has been cleaned, a mild solution of carbolic acid, or enough of any of the lotions above mentioned, to distend the prepuce, should be gently thrown in, retained a moment, and then allowed to escape. Their strength should be reduced if they cause smarting.

If the prepuce is much inflamed, rest, position, and evaporating lotions locally, should be used in addition to the other measures. If the inflammation runs so high that sloughing of the prepuce seems imminent, it is better to take off the tension by slitting up the dorsum. If chancroid be present, however, the surgeon must remember that inoculation of his wound is inevitable. The diagnosis of chancroid can be made by auto-inoculation of the pus. If this gives a positive result, it sometimes becomes a matter of the nicest judgment to decide whether to operate or not. In cases of grave doubt, it is best to operate in order to expose the sore, whose ravages (perhaps of the glans penis) are going on in darkness, uncontrolled. A large chancroid exposed is better than a smaller one concealed.

In chronic and inveterate cases of balanitis, or where insignificant causes produce constant relapse, circumcision affords a certain cure. All the unhealthy, thickened, inner layer of the prepuce should be removed. Where this is seriously objected to, which is rarely the case when there is much suffering, relapses may be rendered less frequent by the observance of the strictest cleanliness, and the use of a filtered solution of tannin and acetate of lead, or of tannic acid in glycerine, ʒ j to ℥ j; or of alcohol, one part to two of water, kept up for a long time after the inflammation has subsided.

Adhesions, as a result of balanitis, are uncommon after the age of early childood.

Vegetations upon the penis are commonly denominated *venereal warts.* This title, however, is not exact, since there is no necessary connection between them and any venereal disease as a cause. They are nothing more nor less than papillary overgrowths, often highly vascular, and composed in large excess of epithelium. They may be prominent and pediculated, or flat, and growing from a considerable surface. They are nearly always multiple. They are caused by the contact of irritating fluids with a membrane of naturally delicate texture, or simply by lack of cleanliness. The most favorable condition for their production consequently exists in gonorrhœa, balanitis, or when mucous patches occupy the cavity of the prepuce. Their favorite seat is just behind the corona glandis, but they are also encountered anywhere within the cavity of the prepuce—at its orifice, upon its cutaneous surface—or even within the urethra. They are found also upon the scrotum, and frequently around the anus. They are, when numerous, bathed in a fetid, puriform secretion, and may get large enough within the prepuce to cause phimosis. They occur upon young children, and are found in their greatest luxuriance within and around the vulva of pregnant women affected with irritating discharges—discharges by no means of necessity venereal in any sense.

Treatment.—The observance of cleanliness alone often causes vegetations to shrink up and disappear. In any case this is the first essential to the success of any course. In case vegetations are complicated by balanitis, treatment of the latter will often at the same time triumph over the warts. If they persist, however, or constitute the main disease, all the pediculated growths should be carefully removed with curved scissors, and the surface from which they grow cauterized with nitric acid or any other escharotic. The flat growths are best disposed of by the application of nitric acid, at intervals, until the base from which they spring has been destroyed. If the warts are dry, they may be covered separately with collodion containing corrosive sublimate, in the proportion of ʒ j to ℥ j. This is allowed to dry on, and, when it separates, all or the greater part of the wart comes with it. The application may be repeated if necessary. Where the number of vegetations is too great to allow of their treatment *seriatim*, attention to the general health, cleanliness, and local dusting with calomel, is the proper course. This plan, so efficacious in treating condylomata and mucous patches about the anus, is particularly applicable where the vegetations are surrounded by an excess of moisture.

EPITHELIOMA PENIS.—The epithelial variety of cancer is that form which usually attacks the glans penis and the prepuce. It commences more frequently upon the former—generally after middle life.

Symptoms.—Epithelioma usually first appears as a small, flat, warty, or simply excoriated surface, of which the base is perhaps from the first slightly indurated, especially when the disease commences at the meatus. The surface of this insignificant induration becomes excoriated, bleeds a little and is the seat of a slight darting or burning pain. A dark-colored scab now forms, if the spot is exposed to the air, but this is picked off or falls off, disclosing an ulcerated surface beneath. In this way the disease advances by ulceration backward, involving every thing in its course. The discharge is thin, sanious, fetid ; the ulcer deep, irregular, unhealthy ; the edges hard, sinuous, livid, everted. Its course, at first slow, becomes later more rapid, pursuing the usual march of epithelial cancer in other localities. In some cases the wart-growth becomes exuberant before ulceration occurs.

As the disease advances, the patient fails in strength. The inguinal glans on both sides become involved and may ulcerate. Now, if the strength hold out, the disease will spread from the root of the penis over the abdomen, groins, thighs, and perinæum, and involve the anus. The scrotum may ulcerate away, leaving the testicles hanging out, and in this horrid condition the sufferer dies worn out, or perhaps suddenly from hæmorrhage, some large vessel in the perinæum being opened by the advancing ulceration.

The diagnosis of epithelioma of the penis is often difficult in the early stages. All warty growths, especially if they are not much elevated, and occur upon individuals past middle life, whose habits seem to be cleanly, and above all if there is even a shade of hardness around the base of the growth—all such excrescences should be regarded with suspicion, and their progress carefully watched. When ulceration commences, doubt may be laid aside, and then temporizing is of no avail. Active measures should be resorted to at once, unless the age of the patient or some other condition contraindicates an operation.

Prognosis and Treatment.—An early amputation, before the glands in the groin become involved, affords the only chance of staying the progress of the disease, and this cannot be regarded as very hopeful. If the ulcer is left to itself, death is inevitable. After the inguinal glands become cancerous, all that can be done is to sustain strength, quiet pains with anodynes, and look out for retention of urine, which is liable to occur late in the disease from occlusion of the urethra by the cancerous growth. Catheterism may be difficult, as the orifice of the urethra is sometimes hard to find in the midst of the ulcerated mass, and puncture of the bladder above the symphysis pubis may be required.

DISEASES OF THE CORPORA CAVERNOSA.

Injuries of corpora cavernosa and cancer have been already described.

Inflammation of the substance of the corpora cavernosa is very rare, except as the result of contusion, when it may run high, become excessively painful, and terminate in suppuration or gangrene. Spontaneous inflammation occurs, very exceptionally, during the course of acute dyscrasial disease—typhus, small-pox, etc. It may complicate severe urethritis. It is always a dangerous affection, tending to terminate in gangrene.

Treatment.—Beyond sustaining strength, but little can be done. Evaporating lotions may be used locally. If pus forms, it should be evacuated early, but care is required to distinguish between pus and effused blood.

There are two diseases affecting the corpora cavernosa which require special description: calcification and a peculiar form of chronic inflammation (to which it is difficult to give a precise name), which does not seem to have been yet accurately described by authors.

Calcification of the Penis.—Ossification was the term formerly applied to this affection, until the microscope demonstrated the absence of bone corpuscles in the earthy mass. Calcification consists in a deposition of plates of calcareous matter in the corpora cavernosa, one or both, particularly in the fibrous sheath. The condition is analogous to atheroma of arteries. Mild chronic inflammation, followed by fatty degeneration, precedes the calcareous deposit. The disease usually comes on insidiously, and discloses itself by the fact that erection is imperfect and painful. The penis bends during erection, the calcareous patch occupying the centre of the concavity of the curve, since the sheath loses its elasticity at this point, and whatever of the erectile tissue is involved is, of course, indistensible.

The causes of calcification of the penis are unknown.[1] Injury has no power to produce it. It occurs after middle life, when all calcifications are most common.

Prognosis.—The calcification may cease after more or less of each corpus cavernosum has suffered, or it may involve the whole organ pretty generally. The hard plates and masses of calcareous matter can be distinctly felt on manipulation. Sexual intercourse is liable, finally, to be seriously interfered with, if not prevented altogether. Under these circumstances the patient is often driven to thoughts of suicide, urged on by that morbid depression which always, in the male, accompanies a consciousness of sexual incapacity, be that incapacity fancied or real.

Treatment.—Medicine holds out no hope to the sufferer. If the disease has come to a stand-still and the deposit is superficial and small, it may be removed with the knife—an operation which has been performed with success by Regnoli and by MacClellan.[2]

CHRONIC CIRCUMSCRIBED INFLAMMATION of the erectile tissue of the corpora cavernosa. This malady is excessively rare, and does not yet appear to have attracted much attention from authors, or to have found its way into text-books.[3] The five appended cases embrace all the experience upon the subject which can be offered.

The disease comes on insidiously without apparent cause, although it is liable to be ascribed to local injury. The patient first discovers that something is wrong, by noticing a slight pain in the penis, at a certain point, when the organ is erect. On examination, he detects a hard, flattened mass, with distinct, sharply-defined margins occupying the substance of one or both corpora cavernosa near the surface, and feeling like cartilage—elastic and springy; not with a bony feel like a calcareous plate. The penis bends, during erection, at the affected point, and along the edge of the hardness a little pain is experienced. The indurated mass, which is of varying size and usually irregularly oval in shape, may remain stationary for an indefinite period (Case VII.), gradually decreasing at last without moving, or progress slowly backward (Case V.) or forward (Case VI.), retaining its size and shape, and disappearing anteriorly at the same rate as it advances toward the root of the penis, or *vice versa.* A slight tenderness is felt along the line of advancing induration, and at all times a little extra uneasiness is produced by pressing the induration between the fingers, as well as felt during erection. The disease occurs after middle life. Two of the patients had suffered very mildly from syphilis; the other three presented no symptom of the disease, past or present, on the most thorough examination. Neither gonorrhœa nor stricture has any thing to do with its causation. Specific treatment has no effect upon the induration. The skin of the penis is in no way involved. Although no *post mortem*, so far as known, has disclosed the exact seat and nature of the disease, yet it is undoubtedly, in essence, a chronic inflammation of a peculiar kind, affecting the erectile tissue at a certain point, and so thickening and stiffening the naturally thin walls of the areolæ (probably filling up the interstices with fibrinous exudations) that they cannot be distended with blood during erection of the rest of the organ.[1]

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[1] Cretification of products of inflammation is not here referred to.

[2] Velpeau, "Nouveaux Éléments de Médecine Opératoire," Paris, 1839, vol. iv., p. 336.

[3] Acton—"Reproductive Organs"—mentions vaguely two cases of imperfect erection as "strange anomalies." These, as well as three out of four cases reported by H. J. Johnson (*Lancet*, November, 1851, p. 481), as "chronic inflammation of the corpora cavernosa," were probably similar to those about to be described; but the details given are not full enough, in any of them, to justify a positive conclusion.

Prognosis.—The prognosis is good. The induration does not seem to tend to spread inordinately, nor does the deposit undergo any degeneration or disorganization. Although none of the five cases has entirely recovered, still they have not been injured by their disease so far as heard from.

Treatment.—Blisters and external irritants seem to increase pain, without promoting absorption. Iodide of potassium and mercury internally are ineffective. Iodine might be tried, and the passage of a stream of electricity (constant) through the mass. Time will, perhaps, effect more for the patient than can be promised him by treatment.

CASE V.—In December, 1864, a tall, wiry, healthy man, from the West, came to New York to seek treatment. He was married, had four children, and was fifty-four years old. An induration, measuring three-quarters by one-half inch, oval in shape, could be felt one inch behind the corona glandis in the left side of the body of the penis. No pain was complained of, except slight uneasiness on firm pressure. There was no extra heat locally. The induration had been first observed by the patient three months before. He could assign no cause for its appearance. Since that time it had been advancing steadily backward, getting well in front as it increased posteriorly. The penis curved toward the affected side almost to a right angle during erection. The patient stated that he "once bruised his penis in getting over a fence," and that he had "some disease" of venereal character when a young man, the nature of which could not be positively made out by examination.

Blistering-collodion was ordered, and to repeat. Iodide of potassium internally, and the patient returned home.

In 1868 (four years afterward) he again appeared, to state that the blistering-collodion had caused pain, and increased swelling. The other side (right) became affected. He ceased all treatment for a year, and then improvement commenced. The induration traveled backward, the advancing margin being a little harder and more prominent than the rest of the lump. Slight pain was felt at this margin, but nowhere else.

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[1] This description answers in the main to an analogous circumscribed induration, which may occur in the course of tertiary syphilis—in short, gummy tumor of the corpus cavernosum. It is not necessary to devote a section to the consideration of this affection. It corresponds exactly with the foregoing description, except that a gummy tumor tends to remain stationary, to resolve, to break down or to advance in all directions, but not to advance on one side and get well on the other. Furthermore, gummy tumor is dissipated by treatment. Ricord has given a good description of these gummata of the corpus cavernosum. Zeissl believes that they almost always occur in the posterior third of the organ.

All the induration had disappeared from the penis in the points first affected, and had localized itself in a band a quarter of an inch wide at the root of the organ. Erections had been so imperfect that sexual intercourse had been nearly impossible for a year, but now the narrow band at the root only caused the penis to tilt up sharply. The member became fully erect, and intercourse was unimpeded. To improved general health and "the use of the organ" he ascribed his cure. In 1871 (seven years from the commencement of the affection), in response to a letter, exactly the same condition of induration as that which existed in 1868 was reported, with possibly slight improvement. The patient added, further, that he had an older (seventy-seven years) brother living, who was affected precisely as he himself was, though to a less degree, and had been so for a number of years.

CASE VI.—In 1871, a gentleman of sixty-three, in robust health, which he had always enjoyed, called to state the following facts: About three months previously, during intercourse, he felt a slight twinge at the root of the penis on its upper surface, which he ascribed to the increased fatness of his wife. Shortly after this, he noticed a slight tenderness in the same locality, accompanied by a ring or line of hardness. This lump had grown but slightly since first discovered and had not altered in situation. There was upward curving of the penis on erection.

Examination revealed a perfectly circumscribed induration, with a cartilaginous feel, lying across the penis at its root (one-half by one-quarter inch), occupying both corpora cavernosa superficially. There was only very slight sensitiveness on pressure. There was no opportunity for even a suspicion of syphilis in the history or in the examination of this patient.

The treatment suggested was, to pass the constant current several times daily from as many elements as could be endured without actual pain, through wet electrodes placed on either side of the induration. In this case, injury would seem to have acted as a cause.

The induration advanced forward along the dorsum penis, a thickened, slightly-sensitive, rough ridge, occupying the advancing border. Posteriorly, the mass diminished in volume. All the uncomfortable sensations became aggravated at night and after standing.

CASE VII.—In 1871, a fat, healthy gentleman of forty-six, with three children, also all healthy, was sent for advice about an induration, which had come on insidiously in the substance of the right corpus cavernosum, just behind the corona glandis. It had been discovered shortly before by accident. No known injury had preceded it. During erection there was chordee toward the right side, with a little pain. The induration lay along the right lateral half of the penis and measured one by one-half inch. In all its features it resembled the indurations detailed in the two preceding cases, except that it had not yet been observed to move, and had no raised sensitive border.

This patient had had undoubted syphilis of mild and irregular type. He improved decidedly without treatment, and when last heard from was but little incommoded.

CASE VIII.—In 1871, a gentleman of sixty came to complain of a lump on the dorsum penis, the nature of which he feared was cancerous. He had discovered it by accident seven months previously. It had enlarged considerably since first detected. About four months after finding the lump he noticed defective erection, with slight pain at the implicated spot.

Examination reveals a distinct, circumscribed plate of hardness, having a cartilaginous feel, oval in shape, lying along the root of the dorsum penis. A slightly-raised ridge in front is a little painful on pressure and during erection. Its posterior border loses itself under the symphysis. The anterior edge ends abruptly. The patch extends across both corpora cavernosa, and is evidently situated beneath the sheaths. It measures one and a quarter inch antero-posteriorly, three-quarters of an inch laterally.

Four months afterward the patient returned to say that erections were still more interfered with, rendering intercourse impossible. The lump was extending somewhat anteriorly and laterally.

This case presented no evidence or suspicion of any venereal taint.

Case IX.—In 1872, a perfectly healthy merchant from the West, aged forty-eight, and married seventeen years, presented himself with a hard, semi-elastic patch of induration across the root of the dorsum penis, about one and a half inch each way, the whole giving the idea of two thin plates joined in the middle line of the dorsum, with some mobility at the line of junction. The edges were slightly thickened and sensitive. The induration had advanced forward one inch in six months. Sexual intercourse was not prevented, but some management was necessary in its performance. No possible cause could be assigned.

CHAPTER II.

DISEASES OF THE URETHRA.

Anatomy.—Natural Curve of the Urethra.—Proper Curve for Instruments.—Catheterism; Obstacles to Catheterism in the Healthy Urethra.—Deformities of the Urethra; Imperforation, Atresia, Hypospadias, Hermaphrodism, Epispadias.—Urethral and Sexual Hygiene.—Injuries of the Urethra.—Urethral Fever.—Foreign Bodies.

The urethra is the common duct for the escape of urine and semen, and, in considering its diseases, this double function must not be lost sight of. It is always a shut canal throughout its whole course, except when distended by some foreign substance. Commencing at the neck of the bladder, it tunnels the upper part of the prostate, perforates the triangular ligament, and terminates at the end of the penis. Its size varies greatly, and, like the penis and testicles, it remains comparatively very small until after puberty. Its size is not constant for a given size of penis, a small member being sometimes provided with a large urethra, and *vice versa.* Its length has been estimated at all points between five and fourteen (Pitha) inches. The length varies with the condition of erection or flaccidity of the organ. It may be lengthened by disease (enlarged prostate). In round numbers, the length of the urethra of a well-proportioned adult is eight inches, six lying in front of the triangular ligament (spongy portion), a little less than one inch between this and the apex of the prostate (muscular or membranous portion), a little more than one inch surrounded by the prostate (prostatic portion).

The spongy portion is surrounded throughout by the erectile corpus spongiosum, terminating below in the bulb. Here the canal pierces the triangular ligament—that firm, fibrous fascia, stretching across the space bounded by the ischio-pubic rami—and, becoming membranous, is covered (besides the muscular fibres of organic life) by voluntary muscular tissue which entirely surrounds it. This muscle has had special names given to different portions of it by Guthrie, Müller, and Wilson. In this muscular group, described as one muscle by Cruveilhier[1] (transverso-urethral), is often the seat of spasmodic stricture; and it is here that muscular contraction may oppose the passage of an instrument into the bladder for several minutes, even when there is no evidence of urethral disease. These are the muscles which constitute the voluntary "cut-off," over which every healthy individual has full control. To allow the urine to pass, these are voluntarily relaxed, with the vesical sphincter, and then the detrusor expels the urine by its tonic tendency to contraction, over which the individual has no control. If a catheter be introduced, so as to do away with any effect of the "cut-off" muscles, no voluntary effort of the individual can arrest the stream of urine, nor indeed cause it to flow with greater force unless the abdominal muscles or diaphragm be called into action.

This "cut-off" then controls urination in health: relaxed, the urine flows; voluntarily contracted during any part of the act, the stream is cut off as sharply as if by a knife.

Some erectile tissue and a good deal of unstriped muscle are found around this as well as around all other portions of the urethra, but the function of the cut-off muscle must be kept clearly in view, on account of its bearing upon catheterism and spasmodic stricture.

The membranous urethra is, of all parts, the most positively fixed. There is no marking on the mucous lining of the canal to indicate any division between it and the spongy portion. The separation into parts is arbitrary. The prostatic urethra bores the prostate, sometimes barely covered by that organ above, sometimes surrounded by a considerable thickness of the same.

Unstriped muscle, of which the prostate is mainly composed, surrounds the urethra from one end to the other, and enters largely into the erectile structures of the penis as well. Stilling[2] has clearly described and given prominence to the latter fact.

The diameter of the urethra varies even more than its length. It has been estimated at from two to six lines. *A fair, average, well-formed adult urethra measures about three-eighths of an inch in diameter.* Much more important, however, from a practical point of view, is the relative size of the urethra, and this does not vary. Every urethra has normally two points of sensible narrowing, and two of decided dilatation, the former at the meatus urinarius and triangular ligament, of which the meatus is always the smaller. Like every pipe designed by Nature or art to throw a smooth stream, the orifice is smaller than any other portion of the tube, a fact to be constantly held in view. The two points of enlargement are the fossa navicularis (so called from its supposed resemblance to a boat), which is situated just inside the meatus, and the bulbous urethra, occupying a position immediately in front of the triangular ligament. Of the two, the latter is the larger. The urethra enlarges again in the prostate (prostatic sinus). Fig. 7, from Thompson, shows these points in diagram.

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[1] *Op. cit.*

[2] "Die rationelle Behandlung der Harnröhren Stricturen," etc., Cassel, 1870–'72.

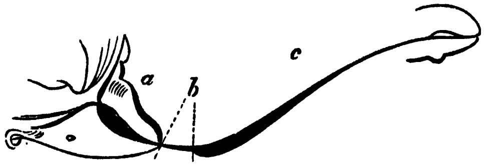

FIG. 7.—(*Thompson.*)
a, *b*, and *c*, represent the Prostatic, Membranous, and Spongy Portions.

In the fossa navicularis lies the valvule or lacuna magna (Fig. 8), a little mucous flap on the roof of the urethra about half an inch from the meatus, shutting in a fossa about two lines deep. In this valvule the points of small instruments are very apt to become engaged. There are other blind pouches or lacunæ of variable size scattered along the urethra, chiefly on its roof, and known as the sinuses of Morgagni. They run parallel with the urethra for perhaps half an inch, and terminate in a *cul-de-sac.* Cruveilhier found one an inch long. The openings of these sinuses all look toward the meatus, and are often large enough to receive the points of filiform instruments, a fact to be remembered in manipulating with fine bougies (*see* Fig. 29). Another lacuna in the urethra, which may catch the point of a fine instrument, is the sinus pocularis (Guthrie) or utriculus of the prostate, a deep little depression running down in front of and underneath the veru montanum.

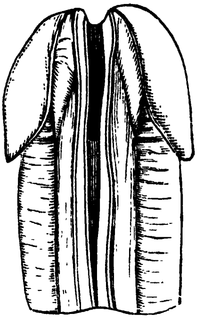

FIG. 8.—(*Cruveilhier.*)

The mucous glands of the urethra are small clusters of minute follicles, very abundant, opening either on the free surface of the membrane or into the sinuses of Morgagni.

Cowper's glands are small, round, lobular bodies about the size of cherry-stones, lying just behind the bulb of the urethra in the transverso-urethral muscle. Their ducts are sometimes very long, but average a full inch, and open into the floor of the urethra. Their fluid is supposed to aid in diluting the sperm. The urethra has about the same amount of sensitiveness in health as the conjunctiva. In the prostatic sinus, however, sensibility is exaggerated. The color of the membrane is a pale pink. In a state of rest its walls lie in contact, obliterating the cavity of the canal, so that a cross-section presents a slit instead of an opening (Figs. 9, 10, and 11).

CURVE OF THE URETHRA.—In connection with the anatomy of the urethra, it is advisable to give some details of explorations, and of catheterism and the use of instruments in the normal canal.

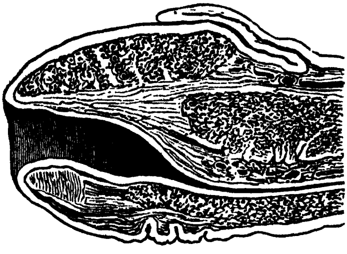

FIG. 9.—(*Cruveilhier.*)
Vertical Section through Glans and Fossa Navicularis.

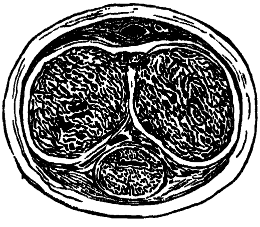

FIG. 10.—(*Cruveilhier.*)
Transverse Section of Penis.

The lowest point of the urethra is just in front of the triangular ligament, where it lies about one inch beneath the symphysis pubis. From this to the meatus the canal takes any position according to the direction given the penis; toward the neck of the bladder, however, the urethra is said to have a fixed curve. This is not strictly true, for straight instruments may enter the bladder—a proceeding rather difficult, often painful, never absolutely indispensable, if indeed necessary. At rest, however, the urethra has a curve which, in the membranous portion, is fixed, and runs, on an average, at a distance of from two-fifths to three-quarters of an inch from the symphysis pubis. It varies slightly with individuals and in the same individual at different periods of life; being shorter and sharper in the child, longer in the old man. A distended bladder or enlarged prostate lengthens the curve.

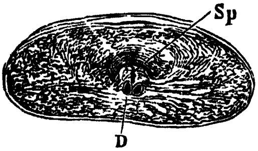

FIG. 11.—(*Cruveilhier.*)
Transverse Section of Centre of Prostate Ejaculatory Ducts.
Sp, Sinus Pocularis.

The proper average curve, as recognized since Sir Charles Bell,[1] and insisted on by Sir Henry Thompson,[2] the one which will mathematically accord with the greatest number of urethræ, is that of a circle three and one-quarter inches in diameter; and the proper length of arc of such a circle, to represent the sub-pubic curve, is that subtended by a chord two and three-quarter inches long.[3] An instrument made with a short curve of this description will readily find its way through the normal urethra into the bladder without the employment of any force. It is very desirable that instruments intended for habitual use should be so constructed, inasmuch as many of the difficulties of catheterism are due to a defective curve in the instrument employed. The defect most frequently encountered is a too great straightness of the last half-inch—a deviation of the curve at its most important point. In an instrument properly made (Fig. 12) it will be found that a tangent to the axis of the curve *at its extremity* will intersect the projected axis of the shaft at a little less than a right angle (*n k h*). If the curve comprised only a quarter of the circle, the tangent would meet the projected shaft at a right angle (*m g h*); but instruments made of this length and a little longer, as they are usually found, invariably have the *last part of the*

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[1] "Morbid Anatomy of the Urethra."

[2] "Stricture of the Urethra."

[3] "In the winter of 1852–'53, assisted by the late Dr. Isaacs, I made a series of careful experiments upon sections of frozen subjects, as well as by injecting the urethra with numerous substances, afterward carefully cutting out the casts. I found the average curve to be identical with the one given above."—VAN BUREN.

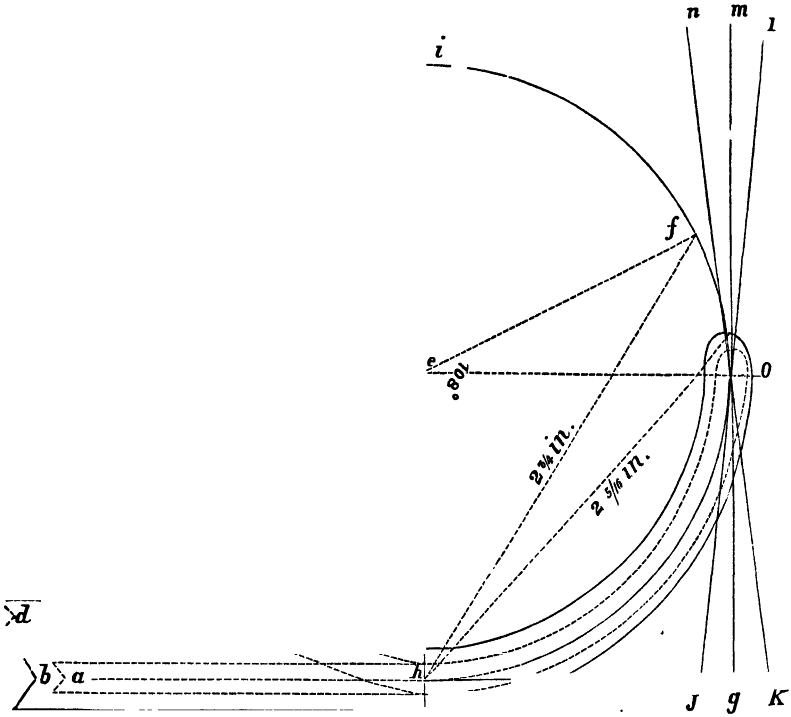

FIG. 12.
Instruments as ordinarily made, with Faulty Curve, *Oa*, *Od* (Béniqué). Correctly-curved Conical Instrument, *Ob*. Length of Natural Curve of Urethra, *fOh*. Length of Cord of Curve of Sound, *hO*, $2\frac{5}{16}$ in.

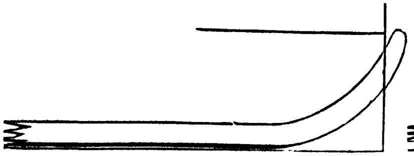
FIG. 13 *A*.—Faulty Curve.

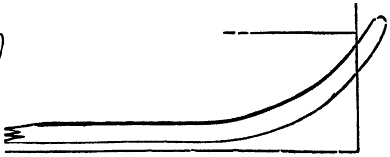
FIG. 13 *B*.—Faulty Curve.

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[1] An instrument destined for habitual use *by the patient* is sometimes made half an inch short in the curve, on account of the greater ease of introduction of such an instrument through the pendulous urethra.

curve tilted off into a faulty direction, as shown in the plate (Fig. 12), making the angle, between a tangent to the axis of the curve at this point and the projected axis of the shaft, obtuse (*l j h*), and falling within the right angle.

Figs. 13 *A* and *B* represent faulty curves—still occasionally encountered on instruments. Fig. 14 shows the correct curve.

It is better to prolong the curve around the circle, and even slightly *decrease* that of the terminal quarter of an inch, as instruments so made are much less apt to be defective, and the point is, for all practical purposes, still at right angles to the shaft, and one and three-quarter inch from it. A knowledge of this relative position and direction of the point is of great importance in difficult catheterism. A moderately short curve is as good as a long one, provided it is accurate; indeed better, for, should the instrument be made with the full length of curve, three-tenths of the circle, that portion subtended by a chord of two and three-quarter inches, its point is so far from the shaft that it is sure to "wabble" when the point encounters an obstruction. This objection is all the more applicable to the Béniqué instrument (Fig. 12, *d h o*), on account of its having a posterior as well as an anterior curve. This "wabbling" is not of serious importance in the healthy canal, but it is very distracting to the surgeon when a tight stricture is to be entered. Here the short conical point, at right angles to the shaft and one and three-quarter inch from it, is vastly the superior in point of steadiness, and is equally certain to follow the urethral curve accurately.

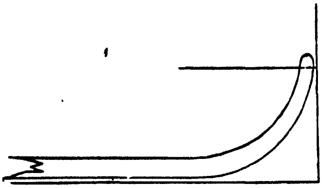

FIG. 14.—Proper Curve.

EXPLORATION OF THE URETHRA — CATHETERISM. — The introduction of a sound, staff, or catheter into the bladder, is generally spoken of as "catheterism." The use of the staff or sound is sometimes denominated "sounding." The manœuvre in either case is the same. There being given a canal of certain dimensions and curvature, and an instrument to fit it, the problem is to introduce the latter into the former. Nothing is easier, although to perform the operation perfectly is less simple than would at first appear. No amount of instruction, no volumes of directions, can teach the student how to pass the sound. He must learn by doing it, first upon the dead, then upon the living body. Some suggestions may, however, be given.

Always make the patient lie down on his back, with his head on a pillow, his legs slightly separated, his body relaxed, his fears quieted, and himself as comfortable as possible. Both hands should be practised in introducing the sound, and the surgeon should keep his elbow supported during most of the operation, in order that his hand may be more steady. If the right hand [illegible]ed, the surgeon places himself at the patient's left, and *vice versa.* To explore the canal, a simple, blunt, steel instrument, of medium size, is selected and properly warmed. The penis is gently encircled by the fingers and thumb of one hand, the instrument held lightly with the points of three fingers and the thumb of the other. The shaft of the instrument is held over the fold of the groin, its handle nearly in contact with the skin, from which latter (the integument, first of the groin and then of the abdomen) it is not to be moved away until the point of the instrument is about to enter the fixed portion of the urethra (membranous). The instrument, at first held along the groin, with its point high and handle low (Fig. 15), is entered at the meatus, and the penis is moulded up over it. It is not pushed into the urethra, but the urethra is made to swallow the instrument, as it were. When the curve, and perhaps an inch of the shaft, has disappeared within the meatus, the handle of the instrument is swept around over the surface of the belly, so as to lie exactly over the linea alba, parallel with it, and still close to the integument (Fig. 16). The whole shaft of the instrument is now to be gently pressed toward the feet, being still kept close to and parallel with the surface of the belly (the penis, meanwhile, being lightly grasped behind the corona glandis, and held steady). The point of the instrument should be followed with the little finger of the hand which manages the penis, and, when it gets fairly past the peno-scrotal angle, the whole scrotum, with the testicles and penis, should be largely seized with the hand and pressed up against the pubis, with slight upward traction. The point may now be felt to settle down and adapt itself to the sub-pubic curve, whence on, the weight of the instrument, properly directed, should carry it into the bladder.

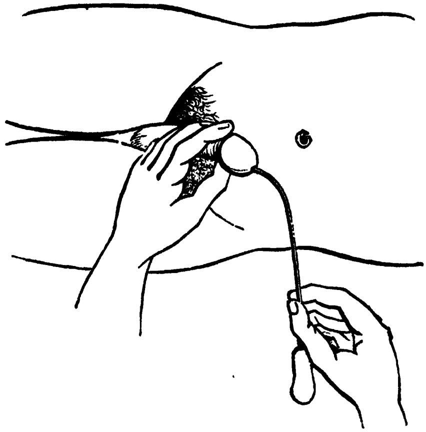

FIG. 15.

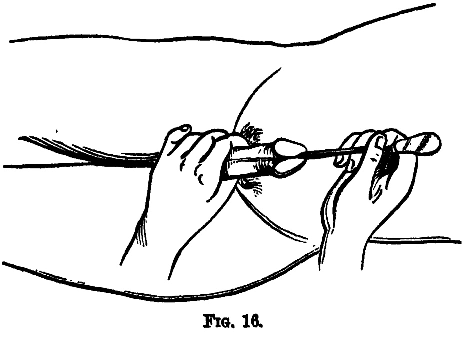

FIG. 16.

As soon as the curve lies well against the symphysis, scrotum, testicles, and penis should be dropped; the hand which held them takes the instrument, simply steadies it in the median line, and gradually carries the shaft away from the abdomen (Fig. 17), making the handle describe the arc of a circle, and depressing the shaft between the thighs, until it lies nearly in the same plane with them. No pushing movement should be imparted to the instrument during this time. The handle is simply made to describe the arc of a circle, and the point, in a healthy urethra, cannot go astray. While the instrument is being depressed between the thighs, the free hand is employed in pressing down upon the mons veneris and root of the penis (Fig. 18), to stretch the suspensory ligament—a point of importance to the easy introduction of an instrument, and one which supplies to the short curve all the advantages claimed for the longer Béniqué curve. When the instrument is in the bladder, its point may be moved freely from side to side by partly rotating the handle.

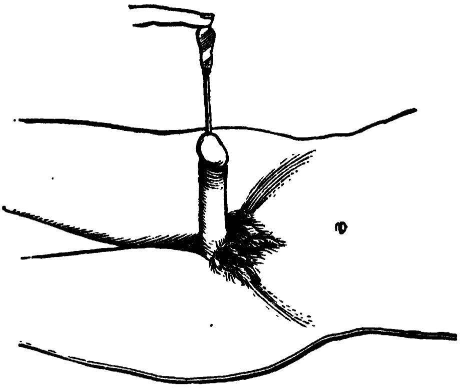

Fig. 17.

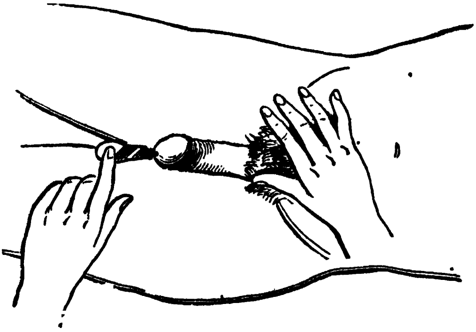

Fig. 18.

The instrument should be withdrawn with the same slowness and care with which it was introduced. No traction is needed. The motions used in introduction are simply reversed. The handle of the instrument is lightly caught, and, without traction, made to describe the arc of a circle, until it touches the abdomen over the linea alba. It is then carried around to the groin, and, by a tilting motion, unhooked from the urethra, ending exactly where it commenced along the groin, the handle low, the point high.

The first principle of instrumentation in the urethra is to avoid the use of force. Even in a healthy subject, sometimes, the beak of the instrument will become arrested by contraction of the unstriped muscle surrounding the canal. A little patient waiting will overcome this, and the instrument glides on. The arrest of a sound from muscular contraction, however, usually takes place in the membranous urethra, from spasm of the "cut-off" muscle (spasmodic stricture). The practised touch rarely fails to detect at the handle of the instrument the slight contractions of the muscular fibres around its point, and in this way diagnosis with organic stricture is easy. Gently holding the instrument in place for a few minutes, with slight forward pressure, will tire out the muscles, and, if the obstruction is muscular, the sound will shortly pass.

There is another point at which a large instrument is liable to arrest in a healthy urethra, namely—the triangular ligament. Here, it will be remembered, the urethra is narrower than anywhere else within the orifice, and just in front of this point exists, naturally, the greatest width of urethra. Now, if the canal be flabby, or the instrument not large enough to distend it (a small sound is much more apt to catch here than a large one) the point may become arrested along the floor by the triangular ligament, or along the roof (more rarely) in the little fossa lying above the edge of the sub-pubic ligament. The instrument is known to be arrested by the bulging out of the curve in the perinæum, as the shaft is being depressed between the thighs and the rebound of the handle when liberated. The obstacle is overcome by gently manœuvring the point of the instrument, by partial withdrawal and reintroduction, or by slight depression of the beak, then lifting it over the obstacle with a finger in the perinæum, at the same time pulling up the point of the instrument to make it sweep the roof of the canal. This will generally render the introduction of a finger into the rectum unnecessary. The dangerous "tour de maître"[1] might be gently tried, but no force should ever be used in any manipulations at this point, as a false passage is easily made here, and under these very circumstances. The depression of the handle of the instrument alone is capable of exerting enormous power. The sound represents a lever of the first order, and the surgeon has the long arm.

With a little patience a suitable instrument will always pass into the bladder, unless there is stricture. When the point has traversed the membranous urethra, it must continue on freely, if the prostate is normal. The so-called spasm of the neck of the bladder does not exist as an obstruction to the passage of instruments.

Instruments, small enough to engage in the sinuses of Morgagni, are not used in the healthy canal. Instrumentation in morbid conditions will be detailed in connection with the different diseases requiring it.

A silver catheter is introduced in the same manner as the sound. In using soft instruments without a stylet, the penis is slightly pulled upon, so as to efface any circular folds, and the instrument is pushed straight onward into the bladder. If it gets arrested, it doubles up, and the hand becomes conscious of a stoppage in the forward gliding movement. Partial withdrawal and rotation during the next forward movement will cause it to pass.

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[1] The *tour de maître* consists in introducing a sound with the shaft between the legs until the point is arrested at the bulb. Then the handle is rapidly made to describe a semicircle until it reaches a vertical position, when it is at once depressed between the thighs. It is brilliant, effective, but dangerous.

No instrument should enter the urethra unless it is smooth, polished, and well oiled. Warmed oil, thrown into the canal with a syringe, greatly facilitates the passage of instruments.

The sensation experienced by the healthy urethra is that of hot points pricking the canal along the part being traversed by the foreign body. As the instrument enters the membranous urethra, a desire to urinate begins to be felt, which increases as the prostate and neck of the bladder become distended by the instrument, so that the patient sometimes believes that urine is flowing away, in spite of the surgeon's assertions and his own observation to the contrary. Nausea, and even syncope, may occur as the instrument distends the prostate, especially on the first introduction in sensitive young people. Occasionally, distention of the prostatic sinus produces a partial venereal orgasm.

If the patient faints, the instrument should be withdrawn at once and the legs elevated, while the head is hung over the edge of the lounge upon which he has been lying. The facility with which this may be done, if necessary, is one of the reasons for placing the patient on his back. The introduction of special instruments (lithotrite) will be given, with their description.

DEFORMITIES OF THE URETHRA.

The urethra is subject to arrest and error of development, but is not often seriously deformed. Among curiosities of deformity may be mentioned the abnormal position of the meatus on the side of the glans penis; the termination of the ejaculatory ducts in a separate canal, running along the dorsum of the penis and opening behind the glans[1] (gonorrhœa of this canal has been noted); termination of the urethra in the groin.[2] Only isolated instances of these rare deformities are known. The urethra is absent where there is no penis. The bladder is usually also lacking in these cases, and the ureters discharge into the rectum. No case of double urethra is known, except with double penis. Valvules, pointing backward (Guyon), occasionally exist congenitally in the urethra, and partially prevent the outward flow of urine, but offer no obstacle to the introduction of instruments. They are found about the veru montanum, or near the bladder. Congenital stricture has been observed several times by Nélaton[3] and by James Syme.[4] In these cases dilatation alone was not effective. Internal urethrotomy was required. Congenital urethral dilatations of great size have been observed in a few cases, attended by atrophy of the corpus spongiosum at the dilated point. Their relief is effected by cutting away the redundant tissue, accurately coapting the edges of the wound, and treating as for longitudinal incision of the urethra.

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[1] Cruveilhier, *op. cit.*, p. 420.

[2] Haller, quoted by Pitha, *op. cit.*

[3] Phillips, "Traité des Maladies des Voies urinaires," p. 271.

[4] *British Medical Journal*, p. 1, 1862.

All the foregoing anomalies are exceedingly rare, and would not probably be met with at all in general practice. There are other deformities, however, which are more common, namely—imperforation, atresia, hypospadias, and epispadias.

IMPERFORATION AND ATRESIA.—The meatus alone may be imperforate (or nearly so), or any portion of the canal may be obstructed by a membranous partition, or replaced by a fibrous cord: in these cases the urachus sometimes continues open for the escape of urine. They all call for surgical interference, and that too, at once, if the urachus be closed.

If the meatus alone is occluded, an opening is made at the point where it ought to be, and the healing of the wound prevented by daily use of bougies. If a diaphragm exists farther down, it may be punctured with a fine trocar. The same instrument may be used where there is atresia, the point being pushed along the course which the urethra naturally follows. If the atresia involves a portion of the pendulous urethra only, success may be confidently hoped for, leaving the patient in a condition of serious organic stricture, requiring the persistent use of means to keep the canal open. The bleeding is not great, and may be arrested by cold and pressure. When, however, the whole urethra is replaced by a fibrous cord, the prognosis is very bad; yet, even here, it is the surgeon's duty to attempt to open a passage into the little sufferer's distended bladder. A direct opening from the perinæum into the bladder would be the most judicious surgical proceeding in these cases, the urethra being attended to afterward. Without a previous opening in the perinæum, a fine trocar, a blunt tenotomy-knife, or a silver probe, may be used, to cut and break down the connective tissue, occupying the position where the urethra ought to be, and this may be continued on from the meatus into the region of the neck of the bladder. Sometimes immediate success crowns this desperate course, while again the attempt has been abandoned, and after a number of hours urine has found its way out through the artificial opening. Several very interesting cases have been collated by Guyon.[1] Such openings necessarily tend to recontract, and throughout life occasional use of the sound would be required.

HYPOSPADIAS AND EPISPADIAS are the most common congenital deformities of the urethra. According to Baron,[2] epispadias occurs once for one hundred and fifty cases of hypospadias.

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[1] "Des Vices de Conformation de l'Urèthre chez l'Homme et des Moyens d'y remédier." Thèse, Paris, 1863.

[2] Quoted by Dolbeau, "De l'Épispadias," etc., Paris, 1861, p. 11.

Hypospadias (ὑπὸ, *beneath; σπάζῶ, I divide*).—This deformity consists in an arrest of development of a portion of the lower wall of the urethra, its lateral halves failing to unite in the median line. The embryo at two months has hypospadias normally. The scrotum has not yet united, and, if natural evolution ceases here, the last degree of hypospadias results with bifid scrotum. Hypospadias may occur at any point in front of the membranous urethra, but does not involve the latter or the prostatic portion of the canal; consequently, no matter how extensive hypospadias may be, the patient has control over the escape of urine. When hypospadias is scrotal, the penis is usually very imperfectly developed, imperforate, and looks like a large clitoris. The bifid scrotum, kept reddened and moist by the urine where its two surfaces come into contact, passes very well for a vulva, and, in this way, some of the so-called hermaphrodites are formed, the true sex perhaps only being discovered after adult age has been reached—when the beard begins to grow, and the testicles to develop. The monstrosity known as hermaphrodite does exist, but is excessively rare. To constitute a true hermaphrodite, there must be penis and testicle, uterus and ovary.[1]

Hypospadias, anterior to the peno-scrotal angle, is more common than the scrotal variety, and most frequent of all is hypospadias confined to the glans penis or its immediate vicinity. That part of the urethra lying between a hypospadial opening and the meatus is usually absent or impervious, but may be patulous for a short distance in front of the opening in the floor of the urethra, or even up to the meatus. Hypospadias, as commonly encountered in practice, consists of an absence of the frænum preputii, and a flaring open of the meatus inferiorly, or an inferior opening in the canal within a few lines of the natural meatus, the position of which is usually marked more or less perfectly in its usual site. The glans penis may be bifid. The urethral orifice in hypospadias is small, as a rule.

The only disturbances caused by hypospadias are functional. The patient may not be able to pass water without wetting himself, as in scrotal hypospadias, and if the opening is too low in the canal he may be impotent, from inability to throw the semen against the uterine orifice.

Simple hypospadias rarely calls for surgical interference, and operations which have been performed for its relief are not over-encouraging in their results—that is, in regard to restoring large portions of the canal—but rapid advances are now being made in this direction (Duplay).

Hypospadias of the glans penis is unimportant; many patients possess it without being aware of the fact. It may be necessary to enlarge the opening in case of stricture of the urethra, in order to introduce instruments of sufficient size to accomplish thorough dilatation.

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[1] Concerning hermaphrodism, may be consulted, with advantage, the extensive work of Isidore Geoffroy Saint-Hilaire, "Des Hermaphrodismes: Hist. gén. et prat. des Anomalies de l'Organisation," etc., 1836, vol. ii.; and Art. "Hermaphrodism," Nouveau Dict. de Méd. et de Chir. pratiques, 1873, vol. xvii., p. 488.

If a hole exists in the floor of the urethra, and the canal is found to be pervious in front of it up to, or nearly up to, the meatus, the case may be operated upon as if it were simple imperforation, and, after continuity of the canal has been established, the hole in the floor might be closed by a plastic operation (*see* FISTULA).

Complications.—One complication of serious importance may occur with hypospadias, which always demands operation. It is where the corpus spongiosum and urethra are too short, so that, although the meatus urethræ may be found at or near the apex of the glans, still the short urethra acts like the string of a bow, and keeps the penis curved at all times, particularly during erection. The patient is usually retromingent. These cases are rare, but they have been operated on successfully.[1]

Each operation must be modified according to the amount of deformity. The indications are, to loosen the urethra and transplant its orifice sufficiently far back to keep it from exercising any traction when the penis is erect, and to incise the fibrous sheaths of the corpora cavernosa beneath transversely, and freely enough to allow the organ to be straightened; or even to divide the fibrous septum of the corpora cavernosa with a tenotome, if it also is contracted (as performed successfully by M. Bouisson[2] for curvature of the penis). This point of "straightening the penis" is important. If it be neglected, although the urethra may be liberated, still the penis will remain curved during erection, because the sheaths of the corpora cavernosa are contracted and indistensible. The bleeding is very apt to be troublesome in this operation. Acupressure was of service in arresting it in Weir's case. Flaps may be taken from the sides of the scrotum to cover the under surface of the penis, from which the urethra has been taken away; and if, as in Weir's case, the patient desires to marry, an imperfect intromittent organ may be furnished him, which will put an end to his inability to cohabit, but not to his impotence.

EPISPADIAS (*ἐπὶ, above; σπάζῶ, I separate*) is a fissure of the superior wall of the urethra with ectopia of the canal (Guyon). It is very rare. The urethral opening may be upon the glans, or anywhere along the top of the penis, as far back as its root. When the membranous and prostatic urethra are involved, there is also extrophy of the bladder. The orifice of the urethra in epispadias is large. Sometimes a finger may be passed through it into the bladder, that part of the urethra lying in front of the opening being an open gutter. Incontinence of urine is frequently observed when the opening is far back, especially if the pubic bones are separated.

There may be complete epispadias without exstrophy of the bladder. Dolbeau[3] has published an autopsy of this condition, with plate. The penis is short and thick in epispadias, or small and more or less deviated. The pubic bones are usually, but not necessarily, separated in complete epispadias. In such cases there may be hernia of the bladder, without positive exstrophy.[1]

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[1] One case by Dr. Weir, *New York Medical Journal*, March, 1874.

[2] Quoted by Guyon, *op. cit.*

[3] "De l'Épispadias, ou Fissure uréthrale supérieure, et de son Traitement," p. 46, Plate III. Paris, 1861.

Epispadias is an arrest of development in the upper wall of the urethra, but it is still a matter of hypothesis how the urethra gets above the united corpora cavernosa; for, even when the genital buds, which are to form the corpora cavernosa, are still separate at the fortieth day of fœtal life, the urethra is beneath them. The fact, however, remains, as proved by Dolbeau's dissection, that the urethra gets above the corpora cavernosa, and fails to unite in its upper wall, the corpora cavernosa effecting their faulty union none the less. With exstrophy of the bladder, where the lower part of the abdominal wall is absent, and the pubic bones do not come together, it is easier to understand how the roof of the urethra may be wanting throughout.

Treatment.—Mature surgical judgment can promise little from operative procedure in epispadias. The adaptation of a proper urinal is the best treatment, either the model advised for exstrophy (Fig. 75), or the rubber urinal (Fig. 73). Operations which have been undertaken nearly always fail, erections and contact of urine, with smallness of the flaps, being the chief causes. The operations which have been most successful in covering over the canal are those of Nélaton and the modification by Dolbeau. They consist in freshening the edges of the flattened urethral furrow, and bringing down over it a quadrilateral flap of integument, which is adjusted, epithelium inward. The raw surface of this flap is in its turn covered by sliding flaps (epithelium outward), from the sides of the penis; or by dissecting up a flap from the scrotum, leaving it attached on both sides and running the penis under it, so as to bring the raw surfaces of both flaps into contact, separating the scrotal flap after firm union has been effected. Both of these operations have been successful in roofing in the canal, but the incontinence of urine has not been overcome.[2]

URETHRAL AND SEXUAL HYGIENE.

Before passing to the morbid conditions of the urethra, its hygiene in health and disease demands consideration.

That the urethra may be in a healthful state, able to get well if diseased, and then to remain well, two points must be observed. They comprise fully the hygiene of the canal. They are:

(1.) That the urine be non-irritating in character.

(2.) That sexual excitability be quieted.

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[1] *Journ. de Méd., Chir. et Pharm.*, p. 14, 1841.

[2] For minute details of the operation, *see* Nélaton, "Traité de Pathologie externe" and Dolbeau. Thèse *cit.*

(1.) Urine, to be non-irritating, must be normal, faintly acid or neutral, free from sharp crystals, and not too concentrated. Hence measures tending to bring the fluid to this state are hygienic. These measures include general hygiene of the skin, stomach, muscles, lungs, etc., but also in many cases (especially where the subject is of gouty habit) certain dietetic precautions. The latter consist in the avoidance of all alcoholic fluids, especially sweet fermented wines and malt liquors. New ale is particularly harmful. All of these substances tend to create sharp crystals of uric acid in the urine, as well as to concentrate and acidify it. From this cause alone inflammation of the urethra may spring. Lemon-juice is also somewhat irritating to the urethra, as are, to a mild degree, all the condiments, salt, pepper, mustard, and, it is said, asparagus. In inflamed states of the canal, general hygiene prescribes rest.

(2.) The quieting of sexual excitability is an object not less important, but far more difficult to accomplish. No part of the body can be in perfect health unless its function is being regularly and satisfactorily performed. This is seen in stomach, brain, muscle, excretory duct. For example, when all the urine escapes from the urethra, through a large fistula in the perinæum, the fore part of the canal contracts and becomes hyperæsthetic.

The urethra, however, only performs the function of a sexual canal at longer or shorter intervals. If there were no erotic fancies, the urethra would never be called upon to participate in the sexual function, and the latter would have no influence over its health or disease. In the eunuch the hygiene of the urethra undoubtedly does not include the sexual problem.

If, then, the individual be absolutely pure in thought, word, and deed; if he never have nor have had an erotic fancy, direct or remote, then his urethra would be a urinary canal, and its hygiene would be simple. But absolute purity is not a common attribute of man, as any one who has the honesty to accept facts must allow, and the rule that every male adult has more or less strong sexual longings and necessities must be admitted. Hence is established the rule, borne out daily and hourly by an intelligent study of the parts concerned, both in health and disease, that the urethra is not in the best conditions for health unless the sexual needs are attended to. There is no possible means of accomplishing this result except marriage. Fornication is always irregular, unnatural, often excessive, and therefore is harmful and worse than nothing, looked at from a merely worldly point of view. Masturbation is degrading, and bears upon the whole well-being of the individual by ruining his *morale*. Nature's safety-valve, involuntary ejaculation during sleep, is inefficient. Marriage alone allows healthy, natural, unstimulated sexual relations, and alone accomplishes the first necessity of urethral hygiene—namely, sexual quietude. Hence the value of marriage as a curative agent in morbid conditions of the urethra, especially if there be any nervous element in the case—an element which is almost invariably present in some degree.

In all conditions of acute inflammation, sexual intercourse must be, of course, absolutely interdicted. Excessive indulgence is bad at any time, but worst of all is stimulation without relief. This state is, unhappily, a common one among the unmarried men of large cities. Such individuals, looking at suggestive pictures, reading exciting books, taking part in impure conversation, become ripe subjects for nervous disease of an obscure sort, not only of the urethra but of the whole body. In fact, this undue stimulation, without appropriate relief, is far more often the cause of hypochondria, melancholy, and functional perversion, than is the masturbation to which the public generally ascribe it. Nor can such an individual, by any plan of fornication, escape the evil consequence to which stimulated but ungratified desire exposes him. Marriage with a pure woman may right him—rarely any thing short of this. Hence when such a case presents itself where marriage is impossible, or if the patient be already unhappily married, there is but one course left to advise, and that is absolute continence and an effort at purity of thought, with strict avoidance of all possible temptations to erotic thought or act, whether entering through the mind, the eye, or the ear—whether actual or implied, direct or remote. Could such a patient imitate the heroic example of St. Augustine—a record of which that honest father of the Church has left behind—he could control the hygiene of his urethra, and doubtless save himself much distress in life.

INJURIES OF THE URETHRA.

Injuries of the urethra, of seemingly an unimportant nature, often entail serious consequences. From the position of the canal, and particularly from the fact that it runs along the middle line of the perinæum, it is more exposed to injury than any other portion of the genito-urinary apparatus.

Contusion of the pendulous urethra is rare. If severe, it is followed by effusion of blood, hæmorrhage, inflammation, abscess, slough, and finally traumatic stricture—often by fistula, with loss of substance. Contusion of the deep urethra, on the other hand, is quite common. The sub-pubic ligament lies directly beneath the symphysis pubis, filling up the angle made by the junction of the two bones. This ligament is nearly as hard as bone, while its lower edge is thin and sharp. In all falls upon the perinæum, the urethra lies between this sharp edge and the body upon which the individual falls. The injury to the urethra is in proportion to the force of the blow upon the perinæum. The canal may be entirely cut across, or more or less crushed transversely. Injury by violence to the perinæum involves to a greater or ess extent the membranous urethra and the bulb which partly overlies it. The immediate results are swelling, more or less escape of blood from the injured bulb into the surrounding tissues, often hæmorrhage from the urethral orifice; difficulty in emptying the bladder, perhaps amounting to absolute retention; possible infiltration of urine; perineal abscess and fistula; and finally traumatic stricture of the most obstinate character. Injury to the perinæum is not uncommon at any age from falling astride a fence, while walking on it, a wheel, while mounting a coach, etc. In boys a kick in the perinæum is often sufficient to damage the canal permanently, without apparently occasioning any immediate injury.

Treatment.—If the patient can pass water and there is no infiltration of urine, no attempt should be made to introduce an instrument into the bladder immediately after contusion of the urethra, for fear of making a false passage at the injured point of the canal. All means, local and general, must be used to keep down inflammation. If, however, there is retention, either immediate or secondary, from inflammation, and warm baths, local fomentations, and opiates do not relieve it, an attempt should be made to pass a soft, French olivary catheter very gently into the bladder. Failing in this, a long filiform whalebone bougie may be tried; and, if this pass, a soft catheter, open at both ends (Fig. 26), may be made to enter the bladder pushed along upon it as a guide. Should this manœuvre be ineffective, a Thompson's probe-pointed silver catheter (Fig. 33), gently manipulated, is pretty sure to find its way in. If the bladder cannot be readily reached, perineal section should be at once resorted to, as this remedies the retention, and is the best treatment for the traumatic stricture which will inevitably follow.

If a soft instrument can be introduced easily, it should be withdrawn after the bladder has been relieved, and reintroduced when necessary. If much difficulty is experienced in passing the catheter the first time, it should be tied in and left for a day or two, unless it causes the patient too much irritation, and then be withdrawn, cleaned, and reintroduced at intervals. As soon as the inflammation following the injury subsides, the passage of conical steel sounds must be commenced, increasing in size until the largest instrument is reached which the meatus will admit, and this must then be introduced by the patient himself weekly for a time, and then at appropriate intervals for an indefinite period, to prevent recontraction of the traumatic stricture.

If infiltration of urine has taken place, large, free, dependent incisions must be made in the scrotum and perinæum; to let out the urine and prevent sloughing, the scrotum must be elevated, and quinine and iron promptly commenced and followed up, to combat further complications. In this or any other condition of serious complication or difficulty, the soundest surgery demands the performance of perineal section at once, inasmuch as this course not only provides for a free issue of urine (infiltrated or not), but puts the urethra under immediate control, and includes the proper means of avoiding traumatic stricture.

WOUNDS INFLICTED ON THE URETHRA FROM WITHOUT. — In children severe wounds in the perineal urethra may result from the breaking of the earthen vessel upon which they sit to empty the bowels and bladder. These may be followed by infiltration of urine with sloughing. Any part of the urethra is liable at any time of life to ordinary cutting injuries, inflicted by accident or design. Fracture of the pelvis, gunshot-wounds, etc., may damage the urethra very seriously. In a general way it may be stated that wounds of the urethra heal more readily in the perinæum than elsewhere (as illustrated by the median operation for stone), and are not apt, in this region, to be followed by fistula, unless there is some obstacle to the free escape of urine in front of the injury (stricture). Transverse wounds of any portion of the canal are followed by stricture (Reybard).[1] Longitudinal wounds, correctly coapted, are not. Wounds of the scrotum, extending into the urethra, are more liable than others to be followed by infiltration of urine, on account of the looseness of the connective tissue of the part.

Treatment of External Wounds.—Wounds involving the perineal urethra, if the canal be healthy (cuts made for stone), and the incision nearly longitudinal, may be left to granulate without interference. If, however, the wound is transverse, it should be dilated systematically while healing, as after perineal section for stricture. Where the pendulous urethra is wounded, the following course should be pursued: Unite the edges of the wound, at once and very accurately, with the finest silk suture. Draw off the urine from four to six times in the twenty-four hours. The catheter should be small, so as to disturb the process of repair as little as possible, and it should be employed often enough to keep the bladder from becoming distended. Should the bladder fill, a little urine is apt to be forced along the urethra outside the catheter, when the latter is introduced, and the object of using the instrument—to keep the wound from the contact of urine—to be frustrated.

When the surgeon cannot see his patient often enough to empty the bladder regularly, a catheter of pure caoutchouc, of medium size, should be first introduced into the bladder, the wound united over it, and the instrument left in, corked, to be opened every few hours. It should be retained until healing is complete. A Holt's self-retaining catheter may be used, or an ordinary vulcanized rubber instrument (retained as described in Chapter X., Fig. 67). Neither a metallic nor a hard woven instrument should ever be allowed to remain tied in the urethra, except in fracture of the penis. They are too irritating for the delicate membrane, liable to provoke ulceration at certain points, if long retained, and should not be used if more suitable instruments are at hand. If the wound in the urethra fails to unite by first intention, the catheter should be withdrawn, and the fistula treated (*see* FISTULA).

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[1] "Traité pratique sur les Rétrécissements de l'Urèthre," Paris, 1858.

WOUNDS INFLICTED UPON THE URETHRA FROM WITHIN are mainly such as are made by the surgeon in careless or rough manipulation (false passage), by divulsion of stricture, by internal urethrotomy, by lithotomy carelessly performed—especially in children where the urethra is cut or torn transversely—by the passage or rough extraction of stone fragments, the introduction of foreign bodies by the patient, etc. When such wounds occur, the urine comes in contact with the raw surface, and "urethral fever" is the common but not inevitable consequence. The more altered and decomposed the urine, the more liable is the patient to suffer.

URETHRAL OR URINARY FEVER.

The uncertainty which surrounds that condition known as urethral fever has not yet been entirely cleared up. The recent and able monograph of Girard,[1] the thesis of Malherbe,[2] and the paper of Banks,[3] presenting new cases, collating old and advancing new opinions, may be consulted with advantage.

The affection may assume either of four distinct types:

1. There may be a sharp chill, of longer or shorter duration, coming on anywhere within the first twenty-four hours (occasionally later), after manipulations upon the urethra or bladder, attended by an elevation of the temperature, and followed by fever (with perhaps delirium) and by sweat. After this there is no further trouble, or there may follow a number of days of general febrile excitement, *malaise*, inappetence, loss of strength, etc., and a slow recovery, or other paroxysms of chill and fever, with more or less complete intermissions, may ensue. This is the most common form.

2. There may be only a few slight rigors without much marked fever or any sweating—these passing off and leaving the patient as well as before.

3. There may be a distinct violent chill coming on rapidly, but of variable duration, attended by intense prostration, alarm, anxiety, and excitement at first, accompanied by violent vomiting, profuse diarrhœa, coldness, and lividity of the surface, almost total suppression of urine, all the evidences of uræmia, and a rapidly-fatal issue.

4. There may be slight chill and fever, followed by the (usually rapid) development of septicæmic symptoms and death, or, more slowly, by true pyæmia and death, the autopsy revealing abscesses in the prostate,

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[1] "Résorption urineuse et Urémie dans les Maladies des Voies urinaires," Paris, 1873

[2] "De la Fièvre dans les Maladies des Voies urinaires." Thèse, Paris, 1872.

[3] "Certain Rapidly-fatal Cases of Urethral Fever after Catheterism."—*Edinburgh Medical Journal*, 1871, p. 1074.

kidney, liver, lungs, suppuration in the joints (knee, shoulder), fluid in the pleuræ, pericardium, etc.

All cases can be arranged under these heads. The first two are by far the most common, and fortunately so, since they are the least disastrous.

That all these disorders should depend upon the simple absorption of urine through an abraded surface is in the highest degree improbable. Other forces are at work, and these are probably shock and reflex action, suspending the function of the kidneys, often already diseased. The condition of the urine also has much to do with the origin of urethral fever. It produces no effect in contact with a wounded surface, when it is normal, being sometimes used (in France) as a dressing to fresh wounds.[1] When in ammoniacal fermentation, it is undoubtedly capable, if absorbed, of occasioning septicæmic and pyæmic phenomena, and, unfortunately, in bladder and urethral disease, the urine is very often more or less decomposed.

The mystery about urethral fever is, why it does not occur more constantly, when the conditions are the same. The majority of patients escape, whether the urine is ammoniacal or not, whether the wound or the violence is great or small. The same patient may have a chill one day and escape it after an exactly similar operation on the next, or *vice versa.*

The simple gentle passage of a small soft bougie may give rise to it, while violent divulsion or urethrotomy, performed a day or two afterward, may produce no such result, and again after divulsion, which has been negative, the passage of a steel sound may produce a chill. Nor is it instrumentation alone which is the exciting cause, since patients, upon whom no instrument has ever been used, have well-marked exacerbations of chill and fever in connection with urethral and bladder disease, and these patients cease to have chills (which they usually call "dumb ague") after the use of instruments in their urethra has dilated the stricture. Other patients have no chill until dilatation has reached a certain limit, after which every effort to pass an instrument of a larger size is liable to be followed by urethral fever. The extent of the injury done is no index of the amount of fever that will follow. The gentle passage of a smooth sound may cause speedy death, while extensive wounds and lacerations of the canal are often absolutely innocuous, and that, too, where the urine is strongly alkaline.

The position of the injury inflicted by the instrument is of importance. At and near the meatus no amount of wounding seems capable of giving rise to chill, though decomposed urine pass freely over the raw surface. The danger increases in proportion to the depth at which the injury is seated. Nor does a wound seem to be necessary at all, since cases are on record where death, following rapidly upon the introduction of a smooth instrument, has failed to reveal by autopsy any lesion of the canal. Here shock and reflex action arresting kidney secretion would seem to be the immediate cause of death. The chill may come on before the instrument used has been withdrawn from the urethra (Case XVI.), but usually it does not follow for some hours, and generally not until after urine has flowed through the canal. In the rapidly-fatal cases, old and often advanced kidney-disease, or at least intense kidney hyperæmia, is found on autopsy; but in some cases these organs have been pronounced normal. Even in these latter there has usually been suppression of urine; but simple suppression of urine does not often kill in one or two days, and, to solve the problem in these cases, we are forced to fall back upon the effects of shock.

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[1] Dr. Partridge, at my suggestion, injected sixty-minim doses of healthy urine into the subcutaneous tissue of the arm of many patients at the Charity Hospital, in 1878 never exciting suppuration.—*Keyes.* (*See*, also, note under EXTRAVASATION OF URINE).

Treatment.—The treatment of urethral fever is mainly prophylactic. The object is to avert chill; for, after the latter has occurred, but little can be done to modify the paroxysm. After chill, morphine subcutaneously produces quiet, and seems to bring on the sweating stage more promptly; while, in uræmic conditions, every effort must be made by cups, baths, hot air, and cathartics, to stimulate the skin and intestine into action, and relieve the laboring kidneys.

The prophylactic treatment of urethral fever is simple. Operations performed under the influence of an anæsthetic are perhaps less liable to be followed by chill. Operations should be avoided if possible upon patients who are found to have structural kidney-disease; and, when surgical interference is unavoidable, particular attention must be paid to building up such patients, and exceeding gentleness employed in manipulating them. Where the urine is highly alkaline and decomposed, more trouble is to be anticipated than where the opposite condition obtains.

Among medicines, quinine probably holds the first place for its power of averting chill. The free and prolonged use of this remedy, before and during the treatment of urethral and bladder disease, seems positively to lessen mortality, and averts complications after operations, as proved by the testimony of almost all surgeons having the largest opportunities of observing this class of disorders. Yet quinine is not infallible, and will not always keep off (*see* Cases X., XI., and XII.) chill; but that it is useful in the great majority of cases there can be little doubt. In preparing for an operation, the patient may take five or ten grains night and morning for several days previously—and it is customary to administer ten grains with a quarter of a grain of morphine at the time of operation. Patients subject to mild repeated chills should be kept upon quinine constantly during the whole course of active treatment. Quiet and rest in bed, immediately before and for some hours after an operation upon the urethra, should also be insisted upon in cases where trouble is anticipated; and, added to this, the relaxing influence of a warm bath is useful. The urine should also be rendered bland and dilute by the previous administration of demulcents with a mild alkali, such as the citrate of potash.

It is exceedingly doubtful whether any thing more than this can be done. Tying in a catheter will not avert chill, and is harmful in other respects. Drawing off the urine frequently through a catheter is usually impracticable, and of doubtful efficacy. Gouley[1] believes that he derives benefit (as a prophylactic) from ten-drop doses of the tincture of the sesquichloride of iron three times daily, and mentions favorably two-minim doses of Fleming's tincture of aconite, suggested by Long[2] as a preventive of chill.

A few cases to illustrate urethral fever will at once make evident the difficulties which surround its study. The profession is familiar with Thompson's case,[3] where a man with old, tight stricture died on the third day *after the passage of an instrument, which had been used upon him very many times before.* Vomiting with severe chill came on in an hour—immediate suppression and death followed. Autopsy failed to reveal any lesion of the urethra caused by the instrument. The kidneys were intensely congested and soft.

Among Velpeau's[4] cases—which have become classical—no kidney-lesions were found in several patients who died in this sudden manner; and hardly a year goes by that the medical journals do not furnish reports of further victims to urethral fever, some without, but the majority with kidney-disease.

Finally, the following three personal cases are selected out of a number as illustrating some of the uncertainties which surround the affection under consideration:

CASE X.[5]—A gentleman of twenty-two, unmarried, strong, finely built, with powerful frame and vigorous constitution, came from the country, in 1871, for treatment for traumatic stricture, dating from a slight injury during boyhood—although the patient was not aware of this fact. Eight months previously, immediately after gonorrhœa (his first attack), he had retention. A surgeon to whom he applied broke one silver catheter in trying to force a passage through his tight stricture, but succeeded in reaching his bladder with a small instrument on another trial, after employing much force, drawing, the patient said, a pint of blood. The next day, according to the patient, severe "intermittent fever" came on, which lasted three months. Attempts were made at catheterism several times subsequently during the eight months, followed invariably by chill, fever, and sickness for two days. Sometimes chills came on when no instrument was used.

Examination detected a stricture in the deep urethra, which would only admit a filiform whalebone guide. A good many slight chills followed its introduction into the bladder. There was a great quantity of blood and pus in the urine, so that examination failed to establish the presence of any kidney-disease—of which there did not exist the remotest symptom. No preparatory treatment was employed, *no quinine taken;* but, on the fourth day, over a whalebone guide, Thompson's divulsor was passed through the stricture and screwed up to No. 20. (The meatus took No. 15 easily.) No chill nor the least unpleasant symptom of any sort followed. In a week the patient introduced No. 15 himself and left the city.

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[1] "Diseases of the Urinary Organs," 1873.

[2] *Liverpool Med.-Chir. Jour.*, January, 1858.

[3] "Stricture of the Urethra," third edition, London, p. 94.

[4] "Leçons orales d. Clin. Chir.," etc., Paris, 1841, p. 326.

[5] This case is detailed at length in the report of the Proceedings of the New York Pathological Society (*Medical Record*), 1873.

He continued perfectly well, passing his instrument occasionally for eighteen months, when he again acquired gonorrhœa, and had to give up the use of his sound for two months. On resuming its use he only succeeded in passing No. 12 with force, causing much pain. Cystitis ensued. He returned to New York, demanding another operation, which should be more radical than the first. Only No. 6 would pass. Cystitis was pretty well marked. Blood and pus abounded in the urine. There was no evidence of kidney-disease. *Fifteen grains a day, of quinine, were given to the patient for two days.* He was put to bed and kept quiet. Urethrotomy (internal) was performed, a cut not a line deep being made. But little blood flowed. No ether was given. Five grains of quinine were taken after the operation.

In half an hour severe chill, vomiting, and purging, came on; total suppression, and death in thirty hours, in spite of vigorous diaphoresis and catharsis, and a slight reëstablishment of the urinary flow.

Autopsy showed the right kidney somewhat atrophied, about two-thirds of the organ being the seat of parenchymatous nephritis. It was intensely congested. The left kidney was still further degenerated and more atrophied. There were several small abscesses in its walls; its pelvis was dilated. The left ureter was absolutely occluded, one inch from the bladder, so that no fluid could be squeezed through it. The occlusion was membranous and did not seem very recent, but there was no hydronephrosis, and the urine in the kidney was not decomposed. The walls of the bladder were immensely hypertrophied.

Remarks.—The bladder-walls were one inch thick, evidently due to long-standing stricture, which had existed from boyhood. The atrophy and degeneration of the kidney were so far advanced that it seemed probable that they had at least commenced when the first operation (divulsion) was performed; *yet this violent operation, which tore the floor of the urethra, and brought a quantity of blood, was the first time that an instrument had been used in the patient's urethra for a year without being followed by chill.* A filiform bougie, four days before, had produced numerous chills. On the other hand, the patient passes for himself, with violence, a No. 12—produces cystitis, but no serious symptoms. Finally, a small cut is made through the stricture, a small instrument only passed, and death follows in thirty hours, after severe chill and suppression.

CASE XI.—Mr. ——, married, sixty-one years old—a weak, thin, white-headed, old man—came for cure of a stricture of over twenty years' duration, which had been dilated some years before, but allowed to recontract. His condition was one of retention, over-distention, overflow, atony; he constantly dribbled, night and day. A study of the case gave the impression that external urethrotomy would be unavoidable. Only the finest whalebone guide could be passed into the bladder, and that with the utmost care and patience. By careful and persistent effort the stricture was dilated up to No. 8 (soft bougie) in three weeks. The *first passage* of No. 8—in spite of three weeks of quinine—*gave the old man a tremendous chill,* coming on five hours afterward with vomiting, high fever, and prostration, which confined him to bed for ten days. There was partial suppression during the first twenty-four hours. The next instrument used was Thompson's divulsor, over a whalebone guide. This was introduced at the office, without ether, rapidly screwed to No. 7, and withdrawn; *much blood followed. There was no chill,* nor the least unpleasant symptom. Gradual dilatation (with steel instruments) was now resumed. On the *first introduction* of No. 9, *without any force*, the patient being in fine condition—taking cod-liver oil and quinine daily—*another chill followed*, with fever which ran nearly as high as on the former occasion. At the next visit, Thompson's divulsor was passed and screwed to No. 12; not the shade of a bad symptom was noticed. The patient was satisfied with this degree of dilatation, and left the city for his home, passing No. 12 weekly; emptying his bladder thoroughly; never getting up at night; fatter, healthier, and happier, than he had been for years.

Remarks.—Nothing in the surrounding circumstances of this gentleman justified his chills. It was not lack of quinine; it was not any known effect of cold; it was not any physical or mental depression. It was not any violence nor (probably) any "intoxication urineuse;" for No. 9 passed very easily and produced a chill, while with the divulsor on two occasions great force was used without causing chill, although a raw, bleeding surface was left in the urethra, over which the urine freely passed. The patient's urine was acid, his kidneys healthy, the amount of cystitis very slight.

CASE XII.—Mr. ——, a merchant of thirty-eight, somewhat overworked, but in general good health, had severe gonorrhœa at sixteen, and "knows" he has had stricture for twenty years. About ten years ago he had retention. He applied to a physician, who, after prolonged but fruitless attempts to enter his bladder (drawing much blood), gave up the attempt. Hot applications brought entire relief, after several hours. The patient had no chill. Since that time he has had no further retention, and has never had any thing like a urethral chill. The urine passed after breakfast was neutral, clear, not at all decomposed, and contained no appreciable amount of pus. There was slight excess of earthy phosphates in solution. Kidneys perfectly healthy.

Examination revealed stricture at four inches, only admitting with difficulty the finest filiform whalebone bougie. Patient was ordered to take gr. x quinine daily. The exploration produced retention (lasting several hours) but no chill.

Several days afterward, Thompson's divulsor was introduced over a whalebone guide, the patient being in his own room, in which he was ordered to stay for twenty-four hours. He took gr. v quinine after the operation, which he was ordered to repeat at night and morning. Twenty hours afterward he had severe and prolonged chill, followed by intense headache and fever, and on the following day a plentiful outcrop of herpes labialis.

Remarks.—A healthy man with urine normal, kidneys sound, who has retention twice, once spontaneously, once after instrumentation, but never any chill, takes quinine, is divulsed and severe chill and fever follow.

FOREIGN BODIES IN THE URETHRA.

The most varied substances are found in the urethra, introduced by the patient under the influence of that perverted and depraved sexual instinct which affects the male of all ages, who gives up his mind to impure thoughts and whose sexual necessities are not met. The following (personal) case, one of many, will serve to illustrate the class:

CASE XIII.—An old man of sixty inserted a head of wheat-straw, procured from the *paillasse* beneath him, into his urethra. It slipped beyond his reach and traveled on into the bladder, where it formed the nucleus of a large phosphatic calculus, which was afterward removed by the lateral operation. It was not until this nucleus was found that the cause of stone was suspected, and only after being detected did the old man confess his tricks.

Seeds, stones, beads, beans, peas, nails, pins, needles, hair-pins, slate-pencils, portions of glass, wax, cork, and a host of other substances are thus introduced into the meatus, and, slipping beyond the reach of the fingers, are not unfrequently swallowed by the urethra. Broken catheters and bougies, especially in cases of stricture, and instruments left *à demeure*, if not well fastened, may slip past the meatus and travel toward the bladder. Fragments of stone after crushing, or small stones, may also become arrested in the urethra and demand the surgeon's aid. Then, again, stone may form in the prostate, or in the urethra behind a stricture, or upon a nucleus—some small foreign body introduced from without; foreign bodies from dermoid cysts, or passing through fistula in the rectum, may reach the urethra and become arrested there. Long bodies always tend to travel toward the bladder, especially if they are sharp at one end (pins), as such bodies are always introduced blunt-end foremost. Stones and rounded bodies lie in the naturally wider parts of the canal (fossa navicularis, bulbous urethra), or become arrested by stricture.

If foreign bodies are not removed, one of three consequences follows: 1. They travel on into the bladder and form a nucleus for stone there; or, 2. Stone forms around them in the urethra; or, 3. They cause the urethra to inflame, bring on retention of urine, and finally become encysted or ulcerate their way out, leaving behind fistula and ultimately stricture.

Treatment.—If the body be long and soft (catheter, piece of wood), it may be transfixed with a stout needle through the floor of the urethra and the canal pushed back over it, like a glove over a finger, as far as possible, when it may be transfixed again, and so urged forward until it can be seized at the meatus; otherwise, the urethral forceps should be used, having long, slender blades terminating in spoon-shaped ends, and so arranged that at any depth of the urethra the ends may be opened without separating the blades (Fig. 93). The little instrument of Leroy d'Etiolles is often serviceable in removing rounded bodies—or the urethral lithotrite (Fig. 96). Other instruments have been devised for removing foreign bodies, but the forceps will generally prove most useful. In manipulating with any instrument, in fact, as a general rule, if the finger on the outside can detect the foreign body and can get behind it, nothing should divert the surgeon from keeping up pressure at that point to prevent his instrument from pushing the offending substance still deeper into the canal.

If the foreign body lies behind a stricture, the latter must be cut, divulsed, or rapidly dilated (continuous dilatation), to allow the passage of a suitable instrument for extraction.

Pins and needles usually necessitate an opening of the urethra from the outside. Such an opening should never be made through the scrotum, for fear of infiltration. It is preferable to cut through the perinæum, even if the foreign body has to be pushed back in order to be caught. The urethra may be opened by cutting upon the foreign body, or upon the end of a staff in the urethra, pushed up to it. The after-treatment of wounds so made is the same as for incised wounds of the urethra. The incisions should invariably be longitudinal. Dieffenbach[1] removed a pin very adroitly from the membranous urethra, by introducing a finger into the rectum, pushing upon its head until the point had been caused to penetrate the skin, and then seizing and forcibly extracting it.

CHAPTER III.

DISEASES OF THE URETHRA.

Inflammation.—Causes.—Subdivisions: Gonorrhœa; Bastard Gonorrhœa; Urethritis.—Symptoms.—Duration.—Course.—Gleet.—Complications of Urethral Inflammation.—Treatment; Method of performing Injection; Abortive Treatment.—Methodic Treatment of Increasing Stage, including Description of Wrappings; of Stationary Stage, including Chordee; of Decreasing Stage, including Copaibal Erythema.—Gleety Stage; Treatment of Gleet.—The Endoscope.—Rare Sequelæ of Gonorrhœa.

GONORRHŒA — URETHRITIS.—Of all the diseases encountered in genito-urinary surgery, urethral inflammation is the most common. Furthermore, although a strictly local affection, and exerting no poisonous action upon the blood, it is the most venereal of all venereal diseases, since it is the commonest malady acquired during the copulative act. A most respectable antiquity is given to the disease by the fifteenth chapter of Leviticus, and although it is contended that the discharge known to the Jewish lawgiver was a simple urethritis, and that gonorrhœa (a specific infection) did not appear until later (according to Astruc[2] in the year 1545–'46), yet the disease was evidently a running from the urethra, and discussions about its simple or specific nature belong to theoretical and not to practical text-books. We have to start from the clinical facts that all inflammations of the urethra are characterized by the discharge of pus, or muco-pus, from the meatus, and that the only guide for treatment is the amount of the inflammation, and the quantity and quality of the discharge[3]—an inflammation of given intensity requiring a given treatment, whether it has sprung from specific contagion, or from chemical or mechanical irritation. This point being fairly understood, the study of the disease becomes simplified. Gonorrhœa cannot be separated from urethritis clinically, hence they must find a common description under the same head.

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[1] "Ueber fremde in die männliche Harnröhre eingedrungenen Körper." Casper's Wochenschrift, i., 1843.

[2] "De Morbis Venereis," Paris, 1736.

[3] "Dry gonorrhœa" is an impossibility. The morbid state formerly known by that name is neuralgia of the urethra.

The term gonorrhœa is etymologically inaccurate, indicating, as it does, a flow of semen (γόνος); but usage has secured to it a precise signification even among the laity (almost to the exclusion of the old Saxon term *clap*), and any alteration would lead to confusion. Urethritis signifies simply inflammation of the urethra, consequently gonorrhœa is urethritis, but the converse does not hold good; and, although it is sometimes absolutely impossible, in a condition of high urethral inflammation, to pronounce upon its origin with certainty, yet it is better, for practical purposes, to retain the two terms, calling that gonorrhœa which has been derived unmistakably from an individual of the other sex with a gonorrhœa, and reserving the term urethritis for all inflammatory urethral discharges having another origin, and for all cases of doubt. This latter precaution is of the utmost importance to the student and young practitioner. It is better that a hundred of the guilty should escape, than that one innocent person should be accused. Experience proves beyond a doubt that a high condition of urethral inflammation, attended by an abundant discharge, and presenting absolutely no diagnostic features to differentiate it from a gonorrhœa derived from a prostitute with a virulent discharge—that such a urethral inflammation may be acquired by a healthy young lover from his equally healthy mistress, by a young husband from his wife, or may be produced by applying a chemical irritant to the urethra. These cases are indeed rare, but are of undoubted authenticity, and it becomes the surgeon's duty to hesitate long before asserting the infidelity of a man or woman, and thus, perhaps, accusing the innocent, and destroying the harmony of a family. It is proper to state that a healthy man may get a urethritis from a woman who has none (may give himself the gonorrhœa, as Ricord puts it) far more easily than a woman can get a discharge from a healthy man; unless, of course, great mechanical violence be used, as in rape.

CAUSES OF URETHRAL INFLAMMATION.—Gonorrhœa is a notoriously contagious disease, and it may be acquired, from any person having it, by the mere contact of the discharge with the mucous membrane of the urethra.[1] It is not necessary that the surface should be abraded. Simple contact is enough without any sexual act, as has been abundantly proved by the experiments of B. Bell, Baumés, Rodet, and others.[1] Taking the idea from Von Roosbroeck's experiments in inoculation upon eyes, Rollet proved that the vehicle of contagion in the pus of chancroid (the most virulently contagious of all secretions) resided solely in the corpuscle. Inoculation of the filtered fluid was always negative. Von Roosbroeck came to the same conclusion for purulent conjunctivitis, and there is little doubt that the rule holds good for gonorrhœa. Thus *is explained the fact which clinical experience proves, that the more purulent (the less mucoid) a urethral discharge is, the more certainly is* it contagious.

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[1] The only mucous (or other, as far as known) membranes of the body capable of taking on inflammation from the contact of gonorrhœal pus are the urethral, vesical, by extension (gonorrhœal cystitis), the vaginal (the uterine rarely by extension), the conjunctival, and the rectal. Buccal, aural, nasal, and umbilical gonorrhœa have been mentioned, but authors are of accord that the cases cited are not conclusively proved. Gonorrhœa of the rectum has undoubtedly been observed in several instances; one case by Tardieu ("Études médico-légales sur les Attentats à la Pudeur," p. 180) in a prostitute who had practised sodomy; and three cases by Allingham ("Diseases of the Rectum," London, 1871, p. 237), all in prostitutes, "who all confessed the manner in which they got so affected."

But, to return to urethritis: besides urethral or gonorrhœal pus there is a host of other irritating causes, acting from within and from without, capable of producing inflammation of the urethra.

A priori there is no reason why the influence of cold should not produce a catarrhal discharge from the mucous membrane of the urethra, just as well as from that of the other mucous expansions; but clinical experience teaches that this is the rarest of all causes, if, indeed, it exist at all for the healthy canal. An irritating substance acting locally seems to be essential to urethral inflammation. The only exceptions to this rule are those cases where prostration or excessive fatigue has given rise to a discharge in broken-down constitutions of the strumous or gouty order, where prolonged ungratified venereal excitement has been followed by actual inflammation of the canal, as in the case reported by Latour, and alluded to in most text-books,[2] or where some inflammatory trouble, usually affecting other parts, has accidentally appeared in the urethra. Some author has reported a case of ordinary herpes of the urethra with discharge alternating with herpes of the thigh. Bassereau and Bumstead speak of cases of muco-purulent urethral flow coming on with the first appearance, or with a relapse of secondary syphilitic eruptions; the cause of which was the development of mucous patches upon the urethral mucous membrane. Ricord[3] details a case of tubercular deposit within the urethra, attended by urethral discharge. A patient under the authors' care with tertiary syphilis has had a muco-purulent discharge on several occasions, depending upon the development of a tubercular eruption in the urethra, growing sufficiently to occasion obstruction to the free escape of urine, and supplying a decided discharge; symptoms always relieved, and the calibre of the urethra restored by the internal exhibition of iodide of potassium. Syphilitic tubercles around the orifice of the urethra are not very uncommon.

Mechanical Violence—sufficiently intense or prolonged—will always produce urethritis; but in these cases the inflammation is usually developed in proportion to the extent and character of the injury, and tends to get well rapidly. To this class of causes belong the rough use of instruments in the urethra, instruments left *à demeure* (tied in), violence inflicted by foreign bodies, introduced from without or passing from the bladder (stone fragments). The abundant formation of large crystals of uric acid in the urine acts also mechanically by scratching, but usually is insufficient to cause urethritis in a perfectly healthy subject. As a rule, urethritis from mechanical violence commences at once, and tends to get well speedily, if the cause does not continue to act.

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[1] Rollet, "Traité des Maladies vénériennes," Paris, 1864, pp. 211, *et seq.*

[2] Rollet, *op. cit.*, p. 236.

[3] "Bull. de l'Acad.," vol. xv., p. 565.

CHEMICAL VIOLENCE.—Irritants acting chemically are potent for evil. Under this head come strongly concentrated acid urine; the action of certain substances ingested—cantharides; strongly acid or alkaline injections; rancid or acrid fluids or secretions—leucorrhœal discharges, lochiæ, and the menstrual flow.

Of these chemical irritants the last group mentioned deserves special notice. As a rule alone they are unable to cause urethritis; something else must intensify their action in order to make them effective, and that something is either prolonged and excessive sexual excitement and indulgence, a weakened condition induced by fatigue and excitement, an impaired state of urethra coinciding with stricture or left behind by previous attacks of inflammation, or individual idiosyncrasy, or coincidence of some other cause, as irritating urine. If this were not the case, married men would be much more afflicted than they are, for few women (especially in large cities) are free from more or less leucorrhœa, and young married couples are very apt to disregard the beginning and the end of the menstrual flow. Viewing the subject from this standpoint, it becomes easy to account for the fact that one man may live with impunity with a woman having a leucorrhœal flow, while another who attempts to share her favors (under stronger venereal excitement) immediately acquires a discharge. The "acclimatation" of Ricord is accounted for in the same way; that is, where a man in his earlier and more amorous approaches acquires a urethritis from a woman with leucorrhœa, but afterward lives with her unharmed, although her discharge may continue unabated. Finally, in this way is explained Ricord's celebrated "receipt for getting a gonorrhœa" ("*recette pour attraper la chaude-pisse*), which consists in taking a young, amorous, pale, blonde girl (preferably with a leucorrhœa), dining with her, drinking white wine, champagne, coffee, and liquor in abundance, dancing with her vigorously, performing the sexual act as frequently as possible during the night, taking a prolonged warm-bath in the morning—and a "precautionary" injection. Such a course would undoubtedly be effective, especially if the individual testing the "receipt" were lymphatic, with a large meatus and a tight prepuce, or had a slight hypospadias; and especially if his urethra contained patches of congestion or slight stricture left behind by old attacks of inflammation.

Before passing to the symptoms of inflammation of the urethra, it is well to take a short, comprehensive view of the three most common forms

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of urethral flow at their commencement as they come under the surgeon's notice. They are given below in the inverse order of their severity, and may be styled urethritis, bastard gonorrhœa, and gonorrhœa:

URETHRITIS.—Cases like the following are not very uncommon. The patient, often a lymphatic young man, perhaps not long married, virgin of all antecedent venereal disease, finds, on the first, second, or third day, after having indulged in sexual intercourse, probably to excess (possibly also after unwonted potations, and with a partner having a leucorrhœa), a slight, uneasy sensation at the meatus, a little smarting, and a pearly drop—or possibly the lips of the urethra glued together—in the morning. Here the prognosis is usually good. The inflammation will probably not run high, and may be combated by the ordinary means. Yet a diagnosis cannot be made with absolute certainty. The chances are vastly in favor of urethritis, but the discharge may become profuse, the inflammation run high, and continue many weeks, and the disease thus become indistinguishable from gonorrhœa. Such an attack may be acquired from any irritating discharge, aided by idiosyncrasy, acid urine, excessive excitement, etc.

BASTARD GONORRHŒA.—A patient comes with a little oozing from the meatus, perhaps with no itching sensation, nor any smarting on urination; but he says that he has had "the disease" on several occasions previously, and he is terrified at this sign of a new attack, which he believes inevitable. He states that (perhaps after copious libations of ale, beer, or champagne) he sinned with a suspicious party, and that while examining himself on the following morning—or after forty-eight hours—he discovered, to his horror, the little opaline drop at the meatus, and he comes at once to seek relief. This is by far the most common story. Such a patient has a damaged urethra, a patch of chronic congestion with or without thickening of the urethral walls, or perhaps a positive stricture, of which he knows nothing, has been left behind by his previous attacks, and he has irritated this surface and given himself a discharge, when the woman was, in all probability, sound, or had, at best, only a certain amount of leucorrhœa. This is not true gonorrhœa: it is bastard. A little alkali internally, rest, and a mild injection, followed by the gentle and judicious use of the steel sound, will usually soon quiet the patient's fears and overcome the threatened evil. In such cases always examine for stricture.

GONORRHŒA.—True gonorrhœa requires no idiosyncrasy, no ale or champagne, no excess, no weakened condition of the urethra for its development, but simply intercourse with a female having a gonorrhœal discharge. Here, after a period of perfect rest lasting from six to eight days, as a rule, the urethral disturbance commences, and runs the given course of virulent, specific gonorrhœa.

SYMPTOMS OF INFLAMMATION OF THE URETHRA.—The period of incubation or hatching—that period which elapses between the suspicious contact and the first appearance of discharge—varies from a few hours (rarely less than twenty-four) to fourteen days (rarely more than eight). The first symptom in true gonorrhœa is usually noticed on the seventh or eighth day. It may be stated as a rule, to which there are, however, numerous exceptions, that the shorter the period of incubation the milder will be the succeeding attack; but this rule does not hold after the ninth day. A tickling, teasing, itchy irritation is first felt at the orifice of the urethra. The lips of the meatus are found adherent, or a slight, bluish, sticky discharge is seen between them. A slight stinging is felt on urination. The lips of the meatus now swell a little, and become reddened. The quantity of discharge increases, and it becomes opaline. Greater pain is felt in passing water. The meatus feels hot and sore.

After the fifth day from its first appearance the discharge becomes much more copious. It gets thick and purulent, and soon acquires a greenish color from slight admixture with blood, which latter may appear in little streaks. If, during erection, the mucous membrane becomes cracked, hæmorrhage may be considerable. Pain is now felt all along the pendulous portion of the urethra, and the canal is sensitive to pressure. Irradiating pains may be complained of in the groins, testicles, perinæum, cord, and back. Involuntary seminal discharges at night are sometimes brought on by the local irritation, and such ejaculations may be exceedingly painful. The urethral mucous membrane becomes thickened by the inflammation, and the stream of urine is consequently small, forked, or dribbling. Retention may come on possibly from spasmodic muscular contraction, or by extension of the inflammation backward, causing sudden congestion of the prostate (Thompson) —a condition recognized by rectal examination. But retention with gonorrhœa is, of all complications, the most rare, unless the patient continues to drink hard, or has already a rather tight stricture before he acquires the disease.

As the inflammation advances, the prepuce may become *œdematous* (lymphitis), occasioning phimosis or paraphimosis; or, if the prepuce be naturally tight, the inflammation may extend into the balano-preputial cavity and light up balanitis. Erections, also, at this time become painful, threatening chordée. This indicates that the inflammation has extended beyond the free surface of the mucous membrane, and has included the delicate meshes of the erectile tissue of the corpus spongiosum. As a rule, the higher the grade of urethral inflammation, the greater liability is there to chordee. In actual chordee more or less of the areolar structure of the corpus spongium has become obliterated by the effusion of plastic lymph, while other portions lose their distensibility. This condition may implicate a longer or shorter distance along the urethra, sometimes nearly the whole pendulous portion. The corpus spongiosum consequently does not allow complete distention of its areolæ, and hence the urethra is comparatively too short for the erect corpora cavernosa, and bends the penis downward like a bow during erection, the urethra being the chord to the bow. If the corpora cavernosa should become inflamed and the corpus spongiosum escape, the arching would be in the opposite direction. This sometimes, but very rarely, takes place. A sort of spurious chordee, upward or lateral, may be caused by inflammation of the lymphatics along the dorsum, or side of the penis. In chordee, great pain is felt from the stretching of the inflamed erectile tissue. This pain is measurably relieved by bending the penis, so as to increase the bow, and in this way to slacken the string; and it passes off entirely as erection disappears. Chordee is most frequent during the night and toward morning. It may render sleep impossible. The point of greatest curvature is situated anywhere along the pendulous urethra, most frequently near the glans *chordee arqué* (Ricord). The pernicious practice of "breaking the chordee," which consists in roughly straightening the penis when erect, gives rise to a hæmorrhage which may become excessive and be the starting-point of organic stricture.

After the disease has continued at its height for from one to three weeks under favorable circumstances, the pain, on urination, which had traveled down to the root of the penis, ceases, the discharge becomes more watery, chordee infrequent. The discharge diminishes down to a drop in the morning, the meatus again sticks together, and finally even this ceases, and the patient is well.

During all this local inflammatory disturbance there is little if any constitutional sympathy. There may be some feverishness for a time, or, in nervous individuals, a real or fancied feeling of prostration during the continuance of the discharge.

The Duration of Gonorrhœa is variable. A well-managed case lasts from three to six weeks, as a rule; but the discharge may continue for months or even years. A first gonorrhœa is the most severe; but it is also the most certain to get perfectly well if carefully managed.

Course of Gonorrhœa.—The urethral inflammation commences at the meatus and travels slowly backward. According to Desormeaux,[1] on the eighth day of the discharge, the anterior half of the urethra has become invaded, its surface is congested, without polish, and covered with little bare spots, like those seen in balanitis, where the epithelium has exfoliated. There is no ulceration. When the discharge is older, the lesions are identical, but deeper-seated. The disease tends to limit itself and to become localized at the bulb, in the fossa navicularis, or at some intermediate point, where there may have been much chordee. At these points of localization, the surface is of a vinous red, the polish of healthy epithelium is absent, and there are perhaps a few granulations. The submucous tissue thickens, impairing the vascularization of the part, and this process may go on to the formation of organic stricture. Where the disease runs this course, instead of getting well, we have gleet.

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[1] "De l'Endoscope et de ses Applications au Diagnostic et au Traitement des Affections de l'Urèthre et de la Vessie," Paris, 1865.

GLEET.—In gleet, whether due to forming stricture or not (the former condition is vastly more common), a certain amount of sticky, bluish fluid—often only a drop at the meatus in the morning—continues to be secreted after gonorrhœa—from altered patches of the urethra—or coming from the stretched and congested membrane behind a stricture.

Gleet, then, is a symptom of two structural lesions, and signifies that there are patches of congestion in the canal, covered or not by granulations, or that stricture exists, and that the discharge comes from behind it. Granulations, analogous to those seen in granular lids, may be observed, when present, through a urethral tube, as may the little vegetations, or polypoid growths, which sometimes spring from altered patches of urethral membrane. Idiopathic gleet may come on in individuals of a strumous or gouty diathesis, the immediate cause being a broken-down constitution or acid urine. Prostatic congestion and enlargement are also liable to be attended by a slight gleet, as are also mucous patches in the urethra, etc. Of these varieties, the strumous urethritis, like other manifestations of the diathesis, is usually found in early life, while gouty gleet belongs more particularly to middle age. An explosion of gout may come on in this way, a distinctly purulent urethritis of some severity appearing suddenly in a gouty individual, after chilling of the legs or excess at table, especially in regard to drink. When an individual with a gleet is found to be gouty, whether his discharge be idiopathic or not, it is particularly advisable to enforce strict urethral hygiene.

Gleet tends to last indefinitely, but is often so very slight as to be ignored. An individual so affected is a ripe subject for bastard gonorrhœa. The simple congested patches, without sensible thickening or granulations, which furnish the gleety discharge after an ordinary gonorrhœa, are kept from getting well by alcohol, malt liquors, sexual excess, fatigue, violent exercise, anæmia, gouty or strumous habit, etc. If one of these causes for the continuance of a discharge do not exist, it will usually get well of itself, or certainly with the help of some mild injection, or by a few introductions of the sound. Gleet is contagious when purulent—the more copious and creamy the discharge the greater its infecting power.

COMPLICATIONS OF URETHRAL INFLAMMATION.—Of the complications of gonorrhœa, some have already been described: balanitis, inflammatory phimosis, chordee, possible retention, and hæmorrhage. Others will receive attention when considering the organs they affect—epididymitis, orchitis, inflammation of seminal vesicles, gonorrhœal cystitis, catarrhal prostatitis, prostatic congestion, prostatic and peri-prostatic abscess. The others will be dealt with after the section on treatment—folliculitis, cowperitis, suppurating peri-urethritis, lymphitis, and adenitis—all being extensions of inflammation from the urethral mucous membrane; finally will be considered, gonorrhœal rheumatism, gonorrhœal ophthalmia, and gonorrhœal conjunctivitis.

Treatment of Urethral Inflammation.—There are two methods of treating inflammations of the urethra:

1. The abortive—which seeks to strangle it at once.
2. The methodic—a treatment based upon the intensity and stage of inflammation.

Injection of the urethra is a proceeding so often resorted to, both early and late, in inflammations of the canal, that the subject of treatment may be well introduced by a few words upon the proper method of performing this surgical manœuvre.

First, as to a choice of instrument. The nozzle of the syringe must be short, for fear of scratching and irritating the already inflamed membrane, and must expand suddenly, so as to be adaptable to orifices of all sizes. Any syringe with an ear-nozzle will do, but the No. 1 A American Hard Rubber Syringe (Fig. 19) is the most appropriate, especially for abortive injections. Glass should never be used, if any thing better can be obtained.

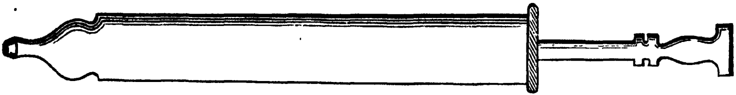
FIG. 19.

A preparatory injection of warm water should be made, when necessary, to free the canal of pus and expose the surface which it is desired to medicate. A preparatory micturition will answer, if care be taken to empty the urethra thoroughly of the last drops of urine, which may not only dilute, but decompose and render inactive some injections habitually employed.

Fill the syringe and expel all bubbles of air. Settle the tip of the nozzle—not more than one-quarter inch at most—into the lower commissure of the meatus. Above this compress the sides of the meatus tightly together (against each other, not against the nozzle), (Fig. 20), and send the piston home with a gentle, gradual motion. The

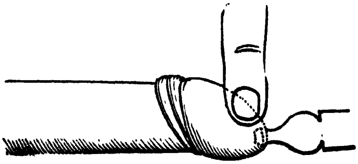
FIG. 20.—Proper Method of Injecting.

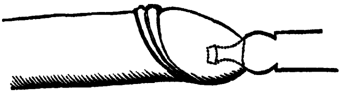
FIG. 21.—Faulty Use of Syringe.

injected fluid must not be too cold. The syringe is now withdrawn, while the thumb and finger, previously placed upon the sides of the glans, close the meatus and confine the fluid in the urethra. If it is desired to bring the injection into contact with the deeper portions of the urethra, this may be effected by compressing the canal from before backward by a sliding motion of a finger of the disengaged hand. This pressure should never be carried farther back than the peno-scrotal angle. If the injection be pushed too far back, it may enter the bladder, an accident always to be avoided. If, however, it be desired only to medicate the fore-part of the canal, the urethra should be compressed from behind forward, the meatus being still held shut. In this way the canal is distended and the injection brought into contact with every part of the surface—a manœuvre always to be adopted in making abortive injections.

If the glans penis be dry, so that the fingers will not slip, injections may be made in this manner without any loss of fluid alongside of the nozzle—an accident which invariably happens in unskilled hands. It is a good plan for the surgeon to inject the urethra himself with warm water the first time, making the patient repeat the operation before him, naming the steps as he goes.

Abortive Treatment.—The idea of aborting gonorrhœa by the internal use of balsams has been abandoned. By abortive treatment is now understood the injection of any irritating soluble substance into the urethra for the purpose of inflaming the canal. Of these substances, nitrate of silver has been almost universally preferred. Sometimes only one very strong injection is given by the surgeon himself—as high as gr. xl. to the ℥ j has been used. It is unnecessary in this day of surgical enlightenment to condemn such a practice. The only allowable abortive treatment, so far as nitrate of silver is concerned, is its use at the strength of gr. ss to the ℥ j, the injection being carefully repeated every two or three hours until a trace of blood is seen in the discharges. Then all treatment must cease. The syringe used in the abortive treatment should never hold more than two drachms, and the fluid injected must be brought well into contact with every portion of the first inch and a half of the urethra. The abortive treatment is not applicable after the disease is more than, at the very most, forty-eight hours old. It is of doubtful efficacy in any case of true gonorrhœa.

Another method of abortive treatment is that recommended by Niemeyer. It consists in injecting several times daily a solution of tannin in ordinary red wine (gr. v to the ℥ j), doubling the amount of tannin after two days if the discharge has not ceased. He praises this method very highly. At least it can do less harm than the other and will abort bastard gonorrhœa sometimes.

As to the effect of attempts to cure by the nitrate-of-silver treatment, it may be said that it very rarely succeeds if undertaken more than twenty-four hours after the commencement of the discharge. The milder, the less inflammatory the attack, the more cold its onset—in short, the more of a urethritis and the less of a gonorrhœa it is—the more efficacious is likely to be the abortive treatment. When it does no good, it invariably does harm. If the first attempt to abort an attack fail, no further trial is justifiable. The injections cause pain (painful micturition), the meatus swells, the penis becomes turgescent, a serous discharge escapes from the urethra. This soon becomes sero-purulent, continues for about thirty-six hours, in successful cases, then gets gleety, and finally disappears. The patient must avoid all alcoholic stimulants during this treatment. A mild alkaline diuretic internally is serviceable.

In true gonorrhœa there is no certainty of success in employing the abortive treatment. With urethritis better results are obtained. Should the treatment fail, the subsequent course of the disease is pretty sure to be more violent than it would otherwise have been. With the mild nitrate-of-silver injection or the tannin in red wine, no more harm than this can well be occasioned; but with very strong injections, especially if they are thrown deeply into the canal and retained for some time under the exploded presumption, once so prevalent, that the disease can be "burned out," most serious complications may follow—such as cystitis, penitis, epididymitis, lymphitis, retention of urine, peri-urethral and prostatic abscess. These complications are very rare, but they have been reported ending even in death.

One consequence of strong injections of nitrate of silver is undoubted, namely—organic stricture, usually resilient, and often peculiarly sensitive and irritable.

From the above remarks it is evident that the abortive treatment is to be condemned, or, at least, only undertaken at the urgent request of the patient, he being willing to assume all risks; and this course the judicious surgeon rarely accepts.

METHODIC TREATMENT OF URETHRAL INFLAMMATION.—This term has been applied by Fournier[1] to a rational treatment, graduated according to the intensity of the symptoms, and varying in the different stages of the disease.

The hygienic part of the treatment is of the utmost importance. If it be disregarded, the best-directed efforts may fail to arrest the discharge. Many cases of simple urethritis and bastard gonorrhœa require little else than the hygienic treatment. The hygiene of gonorrhœa is as follows:

Absolute continence until at least ten days after the entire cessation of discharge, and avoidance of any thing liable to induce sexual excitement—company of a mistress, exciting books, thoughts, etc. No alcoholic stimulants of any sort, particularly no sweet fermented wine (champagne), and, above all, no malt liquor, should be drunk during the treatment. A little claret is sometimes allowable, and is often positively beneficial in the anæmic in the gleety stage. During the height of the disease, abstinence from salt, highly-seasoned food, coffee, and asparagus (Fournier), is advisable. All violent exercise (horseback, dancing, etc.) must be avoided. If the testicles are at all sensitive, a suspensory bandage should be worn. In this way epididymitis may sometimes be averted. If frequent urination come on, it is wise for the patient at once to take to his bed, and stay there until this symptom disappears. Caution must always be exercised about getting any of the discharge into the eyes. The utmost cleanliness, in all respects, is obligatory. Frequent use of the warm bath is desirable. The daily life and habits of the patient, except as above specified, need not be modified.

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[1] Art. "Blennorrhagie," "Nouv. Dict. de Méd. et de Chir. pratiques."

The medicinal treatment is general and local, and varies for the four stages of the disease—the increasing, the stationary, the decreasing, and the gleety. The same hygienic treatment in a general way applies to all.

Increasing Stage.—When a patient presents himself for treatment with a commencing urethral discharge, the surgeon's first duty is to persuade him that what seems the longest is in reality the shortest course. If his discharge promise to be virulent gonorrhœa, this can be said with almost positive certainty; if, on the other hand, it seems to be a urethritis or a bastard gonorrhœa, there is but little likelihood of the disease continuing long, if it is well managed, and the abortive treatment will save no time. After the twenty-fourth, or, at most, forty-eighth hour of the discharge (in gonorrhœa), the abortive treatment is inadmissible.

The hygienic conditions under which the patient must live should be laid down in black and white, and not an inch of license allowed him. If he can be prevailed upon to remain in bed for a few days, so much the better; but this amount of obedience can hardly be expected.

The first, and perhaps only, medicine the patient need take internally, is an alkali. Of the many in use, the citrate of potash is perhaps the best. It is not powerfully diuretic, but yet renders the urine bland, alkaline, and unirritating, and can be taken longer than most of the alkalies without offending the stomach. It may be introduced in a palatable way as follows:

℞. Potass. citratis,	℥ ss–j.
Spts. limonis,	ʒ ss.
Syr. simplicis,	℥ ij.
Aquæ,	℥ j.

S. Dessertspoonful, largely diluted with water, three or four times daily, fasting.

This may be pleasantly taken in Vichy water, of which siphon-bottles can now be obtained in all our large cities. Some patients prefer to take the alkali pure, in which case from gr. x to xl, according to the acidity of the urine, may be given at a dose in powder, dissolved in half a tumbler of water, Vichy water, or, if inflammation runs very high, flaxseed-tea. More or less of this or of some other alkaline preparation should be continued throughout the treatment. If micturition is quite painful, gr. j to iij of the extract of hyoscyamus may be added to each dose of the alkali. This is better than the tincture, since it contains no alcohol. Its taste is perhaps best masked by cinnamon or bitter almond. Instead of the citrate, the bicarbonate of potash or of soda may be used. A convenient form for administering the two latter substances is found in the "compressed lenticular pills," prepared by Dunton. These are as good as the English, and are cheaper. Each pill contains gr. viij compressed into a small compass.

It is well to give this much treatment, even if it is decided to try the abortive plan, for acid, concentrated urine is an obstacle to the success of any course. In the increasing stage of the disease (in true gonorrhœa) the so-called specifics do not do much good. They may be used from the first, but not in large quantities. The balsam of copaiba or the oil of yellow sandal-wood is to be preferred. The latter is more agreeable to the stomach. Both of these substances are best given in capsules which contain gtt. x. each.[1] One capsule with each meal is usually enough for the first stage of gonorrhœa, possibly increased to two if it is well borne. Sandal-wood oil may be given on a lump of cut sugar, gtt. x to xx at a dose. If the expense of capsules is an objection, the alkali and balsam may be administered together in an emulsion known as "Lafayette mixture." The old New York Hospital formula is:

℞.	Bals. copaibæ,	℥ ss.
	Liq. potass.,	ʒ ij.
	Spts. etheris nitrosi,	℥ ss.
	Mucil. gum-acac.,	℥ iv

M. S. Tablespoonful after eating.

This is a nauseating dose, although very effective. Bumstead[2] has modified it into a much more palatable mixture, as follows:

℞.	Bals. copaibæ,	
	Spts. nitrici dulcis,	āā ℥ j.
	Liq. potass.,	ʒ ij.
	Extr. glycyrrhizæ,	℥ ss.

Mix together and add: Ol. Gaultheriæ, gtt. xvj, syr. acaciæ, ℥ vj. M.

The dose is the same as that of the old mixture. Sandal-wood oil may be substituted for the copaiba in either of these prescriptions.

If the use of any of these preparations during the first stage provoke nausea or interfere with digestion, they should be discontinued.

Should micturition be very painful, Milton's plan of immersing the penis in very hot water, before and during the act, sometimes affords considerable relief. Fournier advises a similar use of very cold water.

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[1] Those of Dundas Dick are the best of English, Planten, of American, and Racquin, of French make. The market affords a large variety of very good capsules of French manufacture, especially those containing copaiba alone or in union with other substances.

[2] *Op. cit.*, p. 83.

Soaking the penis in very hot water before retiring seems to have some power in keeping off chordee. The higher the inflammation the more efficient is the local use of hot water.

The wrappings around the penis should be as light as possible. An excellent and efficient, though rather warm wrapping—if the discharge is profuse—may be made by rolling up the last two inches of the penis in several thicknesses of thin, brown water-closet paper, twisting up into a round rope the inch or more of paper projecting beyond the prepuce. This retains itself. If the discharge is light and the prepuce long enough, a little piece of lint spread over the meatus and glans, and retained on either side by the prepuce, makes the best dressing to protect the clothes. Or, if the prepuce is short, it may be retracted, and the glans passed through a hole just sufficient to receive it, cut in the centre of a large piece of muslin. The muslin is drawn behind the corona. Finally, by pulling forward the short prepuce, the dressing is completed. Bumstead's idea of a pair of half-drawers, like swimming-drawers, worn next the skin, is excellent, in certain cases, for cleanliness.

Injections are of doubtful advantage in the increasing stage of gonorrhœa. In bastard gonorrhœa and mild urethritis they are of great importance from the first. If a diagnosis of either of the latter conditions can be made, one of the following injections may be commenced with at once:

℞.	Liq. plumbi subacetatis dil.,	℥ j.	
	Extr. opii aqu.,	gr. vj.	
	M. et cola.		
℞.	Zinci sulphatis,	gr. j–iij.	
	Liq. plumbi subacetatis dil.,	℥ j.	
	M. S. Shake before using.		
℞.	Zinci sulph.,	gr. j–iij.	
	Aquæ,	℥ j.	M.
℞.	Acid. tannic.,	gr. v–x.	
℞.	Aluminis exsic.,	gr. vj–x.	
	Aquæ,	℥ j.	M.

One of these, or any other mildly stimulating injection, may be used from twice to four times daily after urinating. It is better to commence with a weak injection, increasing in strength if it is well borne, but does not produce its full effect.

These simple means of treatment will often keep a mild urethritis within bounds, and prevent a bastard gonorrhœa from becoming violent. If after a week or ten days the discharge has not become creamy, but seems stationary or declining—being still moderate and muco-purulent—the treatment recommended for gleet should be adopted, and a search for stricture instituted. If, on the other hand, the inflammatory symptoms and discharge increase, then the case, in all probability, is one of virulent gonorrhœa, and the case passes on rapidly to the second stage.

STATIONARY STAGE.—In this stage all the inflammatory symptoms have reached a certain high grade, where they tend to remain, for from one to three weeks, with very little change from day to day. The treatment of the first stage, without any injections, must be kept up. Rest, as nearly absolute as possible, must be enjoined upon the patient. Fifteen to twenty leeches upon the perinæum will often notably moderate the grade of the inflammation. A less number is of no service. They should on no account be placed upon the penis, as extensive infiltrations of blood may take place into the loose subcutaneous tissue, and œdema, erysipelas, or gangrene, ensue. Prolonged and frequent warm baths are beneficial in this stage. The sandal-wood oil or copaiba, which has been until now kept up at a moderate rate, must be steadily but gradually increased, according to the tolerance of the stomach, until the full dose is reached. The approach of nausea, copaibal erythema, or diarrhœa, indicates that the patient is saturated with the remedy, if it be copaiba; perhaps pain in the back, if it be sandal-wood oil. Patients can rarely take more than three capsules at a dose.

The maximum dose must be maintained for a week. If at the end of that time a positive effect is not produced, the drug in use should be changed, or, possibly, combined with some preparation of cubebs. Should retention come on, and it is one of the rarest complications, a finger in the rectum will usually make out a swollen, hot, tense prostate, as large as an egg, which throbs against the end of the finger, and is very sensitive to pressure. Under these circumstances, fifteen or twenty leeches may be applied to the perinæum; that many, or none. They are rarely if ever absolutely necessary. The patient must be kept warm in bed, with hot fomentations, or a light poultice or water-bag, over the hypogastrium and perinæum; or he may take a hot sitting-bath for a few minutes at a time every half-hour. The water must be above 100° Fahr., and the bath of short duration. The patient should be plied with mucilaginous drinks (flaxseed-tea, etc.), and get the equivalent of about one grain of opium every hour until the urine flows, which it invariably will do unless rather a tight organic stricture existed before the gonorrhœal attack.

In any case of great urgency a No. 5 or 6 soft, olivary, French catheter, without a stylet, may be very gently introduced, or, indeed, failing this, the aspirator employed; or Cazenave's expedient of ice in the rectum might be tried.

The most difficult part of the treatment of the stationary stage is to soothe painful erections and keep off chordee. This can only be effected measurably. No anaphrodisiac has yet been discovered. Camphor belladonna, conium, bromide of potassium, ergot—not one of these possesses the virtues attributed to it. The best course is for the patient to keep his urine dilute and alkaline, avoid lascivious thoughts, and resort to prolonged immersions of the penis in very hot water before retiring. He should sleep, lightly covered, on his side rather than on his back, on a hard bed, after a small evening meal, in a cool room; and, if necessary, use as medicines large doses of lupulin or opium in pill or suppository, preferably the former. Lupulin rubbed up into gr. iv pills, or taken in powder with sugar, is of undoubted service, simply because it promotes profound sleep. But the dose must be large. Less than gr. xx is useless, and from ʒ ss to ʒ j may be given on retiring. No constipation or other bad symptom follows.

If this does not prove powerful enough, it is useless to halt at any thing short of opium:

℞.	Ext. opii aqu.,	gr. ij.
	Camph.	gr. iv.

M. Ft. pil. No. ij. S. One or both on retiring.

Or,

℞.	Extr. opii aqu.,	gr. jss.
	Ol. theobrom.,	q. s.

M. Ft. suppos. S. Introduce into rectum on retiring.

When a patient wakes with chordee, the penis should be plunged into the coldest water which is at hand, or, what is better if it is winter, laid along a piece of iron (axe-head, railing), or other metal, which has been exposed to the cold. The bladder should be emptied as promptly as possible. The patient must be strongly cautioned against breaking the chordee. If this is done, the immediate effect is relief of pain, but the inevitable ultimate consequence is traumatic stricture.

DECREASING STAGE.—The slightest falling off in the amount of discharge, or in the pain, or other inflammatory symptom, ushers in this stage. Chordee, however, may persist long after it has been reached. The time of its advent depends considerably upon the success of previous medication. Advantage must be taken of this tendency of the discharge to decrease. Hygiene and alkali should be kept up, and the balsam or oil of sandal-wood pushed. The stomach has already become accustomed to its presence, and will usually allow the dose to be increased. If the discharge diminishes rapidly, the remedy should be held at full dose, but not pushed. Rarely more than three or four capsules at a dose (gtt. xxx to xl) will be needed, or indeed tolerated. It is exceedingly desirable not to disgust the stomach with the copaiba, as this necessitates its discontinuance. If copaiba is well borne and properly administered, it is the most efficient of the anti-gonorrhœal remedies.

Each of the drugs—copaiba, sandal-wood oil, cubebs, oil of turpentine—imparts an odor to the urine peculiar to itself. Besides its disagreeable action on the stomach, large doses of copaiba (in certain individuals even small doses) give rise, in some cases, to a peculiar exanthema resembling roseola.

COPAIBAL ERYTHEMA.—This eruption consists in the appearance upon the whole body of small red blotches, closely aggregated, slightly elevated, causing a tingling, hot, itchy, sensation. The eruption is unimportant, and subsides in a few days, if the remedy be discontinued. It is sometimes mistaken by young practitioners for a syphilitic roseola. The rapidity of its appearance, the hot, inflammatory character of the patches, the itching and tingling of which the patients complain, are sufficient to make the diagnosis. The pain and itching are soothed by a warm bath. In these cases the urine always smells strongly of copaiba. When such a rash comes on the urethral discharge ceases, but it will reappear as the eruption fades. Consequently it is not wise to discontinue treatment. It is simply necessary to change the drug. Urticaria, or "hives," may also be excited by the ingestion of copaiba, and certain obscure nervous phenomena have also been referred to its use, such as headache and giddiness. Severe pain in the lumbar regions is excited in some individuals by the use of sandal-wood oil in excess.

Thus far nothing has been said about *cubebs.* The different preparations of this remedy are more stimulating than copaiba or sandal-wood, and are consequently better adapted to combat the subacute and distinctly retiring forms of inflammation than the advancing or stationary. They are very applicable to the latter portion of the stage of decline, and to the gleety stage. As a rule they are well borne by the stomach, often increasing the appetite, and allaying dyspeptic symptoms. Occasionally the stomach rebels even against cubebs. Of the powder, the dose is from one to two drachms in sweetened gum-water. The fluid extract, in drachm-doses, is efficacious and not unpalatable; but the most efficient preparation is the oleo-resin. This may be administered in capsules containing gtt. x. The dose is from one to three capsules.[1] By changing from one to the other of these three remedies, in sluggish cases, the effect of each seems to be increased. The compound prescriptions and pastes containing both copaiba and cubebs and other substances, in varying quantities, are unscientific; by using them, a clear appreciation of which remedy is doing good is lost. It is not by combining and multiplying remedies that a gonorrhœa is most speedily cured, but by carefully watching the effect of a given drug, and replacing it, if necessary, with another.

One good reason for combining cubebs with copaiba is, that the former acts as an anti-dyspeptic, and makes the stomach tolerate the copaiba. Hence, if the stomach be delicate, such a combination may be useful. Dr. Bumstead's formula is a good one:

℞.	Copaibæ,	℥ ij.
	Magnesiæ,	ʒ j.
	Ol. menth. pip.,	gtt. xx.
	Pulv. cubeb.,	
	Bismuth. subnitrat.,	āā ℥ ij.

Mix. Divide into gr. v pills. Dose, five to ten.

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[1] The best oleo-resin of cubebs is made by Merck, of Darmstadt.

If the bursting of the capsules in the stomach tends to nauseate, the pilulæ copaibæ, U. S., may be used. These dissolve slowly, and are sometimes less offensive. Some oleo-resin of cubebs may, if necessary, be included in their composition. Turpentine and other so-called anti-blenorrhagic medicines are unreliable in comparison with the three already mentioned.

To recapitulate, *balsam of copaiba* is the best preparation, and is applicable to all stages of the disease, but some individuals cannot tolerate it, and in some it produces derangement of the stomach, skin, and nervous system, unless used with prudence and skill.

More attention is necessary for its successful administration than is usually bestowed upon it. Steadily carried up to the full dose in the stationary stage, with close attention to the gastric capacities of the patient, it is capable of being highly efficient. Within one week after saturation has been reached, the full effect of the remedy is attained. If at the end of this time the stomach can bear no more, and the discharge is unmodified, the oleo-resin of cubebs should be combined with, or substituted for, the copaiba. The above statements only apply to manageable cases where urethral hygiene has been maintained. Protracted employment of full doses of copaiba is damaging to the stomach, and rarely of service in curing the disease if the first effect have failed.

Oil of yellow sandal-wood is a most excellent remedy; in some cases certainly doing better than copaiba. It is not objected to, as a rule, by the stomach, but may produce severe pain in the loins. It is applicable to all stages of the disease. The maximum curative effect is usually noticed during the week, after the full dose of the remedy has been attained.

Oleo-resin of cubebs is usually well borne by the stomach. It may produce slight diarrhœa (as, indeed, may copaiba or sandal-wood). It is fitted for treating subacute and chronic cases, or for use in combination with either of the other so-called specifics.

These three remedies may be alternated, commencing with sandal-wood and ending with cubebs. The last one in use when the discharge has ceased should be continued for at least ten days—one capsule less being taken daily until the remedy is gradually dropped.

These remedies have been found ineffective when given by the rectum. Their action is a local one. They undergo a change in passing through the kidney, and are excreted with the urine. It is the contact of this urine with the inflamed surface of the urethra which produces the benefit;[1] consequently they are useless in the female unless the urethra is affected.

Injections are of great service in the stage of decline. Any of the formulæ of page 65 may be used, commencing with the milder and passing on to the stronger solutions.

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[1] As has been proved in cases of large fistula in the floor of the urethra where the urine could be turned off, the part behind the opening getting well first—the anterior part of the urethra being subsequently cured by being injected with the patient's urine, freshly passed and full of modified copaiba.

Gleety Stage.—A gleet is a mucoid discharge from the urethra. All urethral discharges become gleety before they cease, and such a gleet, following upon an uncomplicated gonorrhœa, tends to get well by the simple observance of the hygiene of the urethra. This rule, however, has many exceptions. In undertaking the treatment of a gleety discharge, its cause must be studiously sought out and treatment applied accordingly. Sometimes the patient requires treatment more than the urethra—as in idiopathic gleet from strumous or gouty tendency. In such cases the observance of hygiene, as affecting the urethra, with alkali, cod-liver oil, quinine, and iron, constitutes the outline of treatment. Of the tonic preparations, the tincture of the sesquichloride of iron holds the first rank, on account of its astringent properties. Excess of treatment is not infrequently the cause of prolongation of gleet, the patient, either with or without a physician's advice, trying blindly one injection after another, and all sorts of internal medication, importuning his friends for their "infallible" prescriptions, and worrying his urethra with endless interference, searching for a specific which he cannot find, notwithstanding the countless number which are confided to him by sympathizing companions. In such a case the best medication is to reassure the patient and instruct him in every thing relative to urethral hygiene (p. 40), leaving the canal entirely alone for a week, simply watching to see what the discharge really amounts to.

Every thing earthly has an end, even a gleet, as Thiry has sagely remarked, and no treatment will sometimes succeed where over-treatment has only served to keep up the evil. Such cases are found chiefly in unmarried young men, who are kept in a constant morbid state of excitement about their genitals by ungratified sexual desire, or its irregular or excessive indulgence. In these cases the "discharge" may be invisible except to the patient, a slight gluing of the meatus in the morning being the only tangible evidence that something is wrong. Here the mind is often more diseased than the body, and marriage is the proper remedy. A regular, moderate exercise of the sexual organs tends surely to keep down congestion and to allow that rest which is most important in effecting a cure. Yet care must be exercised in advising marriage, if the discharge be at all purulent, for no urethral discharge containing pus can be pronounced free from contagious properties. If there be any pus in the discharge, the patient should not marry until it ceases, especially if examination reveal the slightest physical lesion in the canal. If there be no lesion, and only a slight, translucent, sticky discharge (a condition not uncommon), marriage puts the patient in the most favorable position for getting well. There is always a grave responsibility in advising a patient with a gleet to marry; but, if these two points can be clearly established—that there is no considerable physical, urethral lesion, and that the discharge shows no marked purulent character—the advice may be given with safety, and with the certainty of proving beneficial if followed.

The most common of all causes for continued gleet is stricture already present or forming. Special causes of gleet require special means of treatment, and will be mentioned under their respective heads. They are: lacunal inflammation, chronic cowperitis, inflammation of the seminal vesicles, hypertrophy of the prostate, congestion, catarrhal inflammation, tubercular or other prostatic disorder (abscess, etc.), fistula with internal opening, peri-urethral abscess, diathetic idiosyncrasies, mucous patches in the urethra, etc. Next to stricture, an altered congested patch of urethral membrane, with or without thickening or granulations, is the most common lesion keeping up a gleety discharge. The treatment of gleet dependent upon this cause, or existing without urethral or other appreciable lesions, finds its proper place in this section.

Treatment.—Where no lesion is discovered, the following treatment is advisable: The urine must be kept mildly alkaline, without oppressing the stomach, hygienic conditions as affecting the urethra must be carefully observed, the provocation of sexual excitement interdicted. There is no objection to ordinary sexual intercourse if the patient be married and living with his wife; all extra excitement, however, during the act, and all provocation of the sexual appetite, are to be avoided. The use of copaiba or oil of sandal-wood, whichever may have been found serviceable in the stage of decline of gonorrhœa, may be continued, or substituted by the oleo-resin of cubebs in moderation. Tincture of iron, quinine, and a little claret, may be ordered, if the patient is anæmic or run down, and especially if the urine is alkaline, or contains phosphates in excess. A stimulating or astringent injection should be employed. Any of the formulæ already given (p. 65) will answer, but it may be necessary gradually to increase its strength. There is little use of a multiplicity of injections, and of running from one to another in trying to find a specific virtue. It will be hard to prevent the patient from doing this of his own motion, but his own dignity should prevent the surgeon from encouraging the patient in his folly. The fewer the number of injections a surgeon employs the more good will he be able to effect with them. He will learn how to handle them to more advantage, and will understand their power for good or evil. Nearly all known drugs have been at different times vaunted in injection for urethral discharge, but only a few hold their place. Besides the injections already given, several others have proved serviceable in the gleety stage, as permanganate of potash (gr. j to iij to the ℥ j) alone, or combined with a small amount of sulphate of zinc; sulphate of copper (gr. j to ℥ j).

Bumstead praises the persulphate of iron, ʒ ss to ℥ vj. Finally, alcohol is often efficient. Perhaps the best way of using this stimulant, which, like tannin, is indicated where discharge seems to be kept up by an atonic state of the urethral membrane, is according to Ricord's formula, namely—to commence with two parts of rose-water to one of red wine, and to continue increasing the latter until pure wine can be used, unless the discharge cease meanwhile. Glycerine may be combined with any of the above formulæ, as may also morphine, although the latter is rarely of any service.

The substances just mentioned have been proved by long and general experience to be best adapted to the treatment of urethral inflammation. Three points must be remembered in regard to injections:

1. That the old false idea about burning out the disease is absurd, and that the aim must not be to use an injection as strong as can be borne, but, on the contrary, to use as weak a one as will do any good.

2. That, when a gleety discharge ceases under the employment of a given injection, the latter should be continued for at least ten days longer, and given up gradually.

3. That in certain cases the discharge becomes reduced to a minimum, but will not wholly cease. In these cases the injections are probably maintaining a condition of hypersecretion of urethral mucus, and their discontinuance will cause the discharge to cease.

Deep urethral injections may be performed by the surgeon, but they are rarely called for. From one to three times weekly is often enough to use them. The syringe of Bumstead (Fig. 22), or that of Bigelow (Fig. 23), is easily applied, especially Bigelow's, on account of an extra tube which indicates when the bladder is reached, so that, by withdrawing it a determined distance, great accuracy of injection may be attained, regarding particular localities of the urethra.

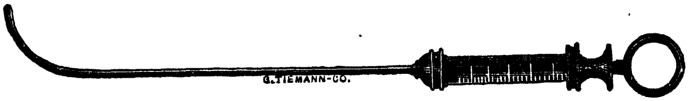

FIG. 22.—Bumstead's Deep Urethral Syringe.

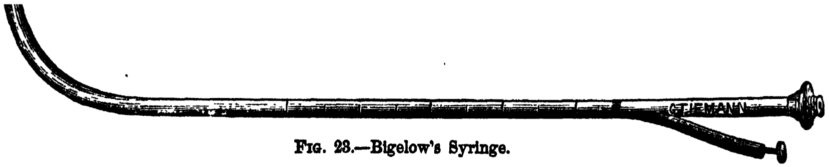

FIG. 23.—Bigelow's Syringe.

Any of the solutions already mentioned may be employed in deep urethral injection. The beak of the syringe is passed through the triangular ligament (there is no reference here to prostatic disease), and the injection made while the instrument is being slowly withdrawn. This plan occasionally succeeds where ordinary injections fail.

In a general way, it may be said of injections that they are among our best weapons for fighting gleety discharges, if used correctly, of a proper strength, and at the right time.

Like all good things, they may be abused. Any injection strong enough to bring blood may be the starting-point of stricture. Any injection, thrown too deeply into the canal, may light up epididymitis or cystitis of the vesical neck. No injection should cause actual pain. A sense of smarting and warmth, lasting a few minutes, is not objectionable.

The direct application of tannin bougies, made with glycerine, has lately been advocated. A much more accurate method is the use of a tanno-glycerine paste in the cups of the cupped sound (Fig. 130), applied directly to the spot whence the discharge comes. This expedient yields excellent results in very chronic cases, the patient having an altered patch of urethral membrane, thickened and congested.

Another style of injection, called isolating, highly praised by Caby,[1] is still occasionally resorted to. It consists in throwing in bismuth, or calamine, or chalk, suspended in a sticky fluid, or as soluble suppositories—the object being to coat over the walls of the urethra with one of these insoluble powders. They sometimes act effectively, but often cause a good deal of discomfort from the collection of little hard lumps of bismuth and mucus along the canal. The following is a good type of this style of injection:

℞. Bismuth. subnitratis,	gr. x–xx.
Glycerini, mucil. acac., aquæ,	āā ʒ ijss.
M. Shake thoroughly before using.	

Milton is loud in praise of blistering the penis externally, combined with mild astringent injection; but this treatment is altogether too severe for general adoption. Electricity, both the continued and the induced currents, internally and externally applied, has been vaunted for the cure of gleet. In the authors' hands it has proved of no value.

Gleet, unconnected with positive urethral lesions, gets well under treatment by injection. If the discharge remains gleety a fortnight or more, even if there be no urethral lesion of importance, a well-oiled, blunt, smoothly-polished steel sound, as large as the meatus will comfortably admit, should be passed into the bladder, with the utmost gentleness and slowness, and withdrawn at once with the same deliberation and care. This simple operation, repeated every third or fourth day, will rarely fail to cure the discharge. The sensibility of the canal becomes blunted by contact with the instrument, its irritability overcome by the slight distention to which it is subjected, while the tonic effect of the cold metal is also probably a factor in producing the good effect. A steel instrument is much better than a soft bougie. There is no object in leaving the instrument longer in the canal than it takes to pass it slowly into the bladder, and as slowly withdraw it. The instrument must fill without stretching the meatus. The meatus may be congenitally small, and this alone may keep up a discharge. In such a case a little pouch can be felt, with a bent probe, formed behind the lower commissure of the meatus. Snch a condition may be promptly relieved by incising the meatus. This simple operation occasionally cures a gleet of long standing.

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[1] "Nouveau Mode de Traitement de divers Affections génitaux chez l'Homme et chez la Femme par l'Emploie de Sous-nitrate de Bismuth." Thèse, Paris, 1858.

Finally, in regard to instruments, the greatest care and gentleness should be employed. Used too often or clumsily, they do harm by increasing the grade of inflammation, or possibly bringing on an attack of epididymitis. In the cases under consideration, no instrument should be reintroduced until all irritation and *temporary increase of discharge*, produced by its previous use, have subsided for twenty-four hours.

Where patches of urethral congestion keep up a discharge, they may be detected by passing a full-sized bulbous bougie into the bladder. When the head of the instrument reaches the altered spot, the patient will complain of slight pain, which will disappear as the bulbous head of the instrument passes on to the healthy urethra beyond. Any little thickening in the walls of the canal is recognized at the same time. Furthermore, if a patient with one of these patches makes water into a glass vessel, and the fluid be held up to the light, one or more thready filaments may be seen gradually sinking through the urine. If one of these is caught and placed under the microscope, it will be found to consist of pus-corpuscles adhering together; in other words, it is a soft scab, and indicates that a portion of urethra is not covered by healthy epithelium, but is abraded (not ulcerated), and covered by soft, round leucocytes. These cells are swept away by the torrent of urine, and rolled over and over in their passage along the canal, in this way becoming drawn out into the little thread-like shreds which come away at every emptying of the bladder. These shreds are always found in cases of forming stricture, in every stage of the complaint, coming most frequently from the distended urethra behind the stricture, and detected only in the first few ounces of urine voided.

When these signs of urethral lesion exist, the gentle use of the steel sound becomes the first requisite of treatment. The balsams may be discontinued, and injections become of secondary importance. Urethral hygiene (p. 40), and the gentle, persevering use of a full-sized conical steel sound, will effect a cure, and bring healthy epithelium upon the congested and abraded surface more surely than any other means.

The endoscope is of some service in treating obstinate cases, but its aid is very rarely required. Thompson's remark about its usefulness is a fair criticism: "If a man has a good and tolerably practised hand, with a fair share of intelligence, I do not think he will gain a great deal by the endoscope; and, if he has not, I think it will be of no use at all."[1] Yet the altered spots of urethral membrane can be very clearly seen through the endoscope, granulations can be detected where they exist, and local applications of considerable strength made, which could not be applied with safety by any other means. The expensive and complicated instruments of Desormeaux, Cruise, and modifications of the same, are but little if at all better than a simple straight urethral tube, blackened inside and furnished with an obturator. The tube known as Otis's urethral speculum answers well. All the illumination required for these tubes may be obtained by reflection from a concave mirror strapped to the forehead. For examining the deep urethra, however, the large instruments are decidedly preferable.

To make a thorough inspection, the tube should be introduced well into the membranous urethra, the obturator withdrawn, the oil and mucus wiped away from the membrane presenting at the bottom of the tube, and then, the illumination being brought to bear, each successive portion of membrane may be inspected as the tube is withdrawn. The healthy mucous membrane has a pale pink color, and contrasts strongly with congested spots which are of a vinous red without polish. Such spots can be plainly seen as they come across the end of the tube, and any granulations upon them are readily recognized by the practised eye. The topical remedy for granulations suggested by Desormeaux, and which can be very accurately applied through the tube by means of a little cotton twisted upon a long probe, is a solution of nitrate of silver of from ʒ ij to the ℥ j up to the saturated solution. The latter should be only used in the case of large granulations, and then is to be very sparingly applied. Iodine, sulphate of copper, tannin, carbolic acid, etc., used as local applications, give fair results. The advantages of treating by the endoscope are, that the spot to which an application has been made may be inspected from week to week, and the effect of treatment critically observed. This topical treatment is to be repeated at first twice a week, then weekly for several months. Success is pretty sure to attend the prolonged intelligent use of the endoscope, but it is only the most obstinate cases that require it.

SEQUELÆ OF GONORRHŒA.

Certain unusual sequelæ of gonorrhœa may be mentioned here before entering into a detail of its complications. After discharge has absolutely ceased, the patient is usually as well as he was before; but there are exceptions. Among the most frequent of these is pain on passing water, ranging from an itching up to an absolute burning; and this neurosis may last from a few months up to many years.

The pain may be confined to erections and ejaculations, the latter depending upon some disturbance at the prostatic sinus. There may be urethral pains independent of erection or urination, sometimes severe in character—perhaps paroxysmal—and known as urethral neuralgia.[1] These different kinds of pains disappear, as a rule, in a few weeks or months. No treatment, except the observance of urethral hygiene, seems to be of much service. If they persist, there is probably some lesion of the canal, even although there be no discharge. Where there is no lesion, a resumption of the physiological exercise of the organ tends greatly to reduce the abnormal sensibility of the urethra. The judicious use of steel sounds at intervals, and the local employment of electricity, seem to hasten a cure. Where the trouble persists, a careful search should be made for stricture. The following case illustrates this necessity:

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[1] *Op. cit.*, p. 181.

CASE XIV.—An unmarried gentleman of twenty-two complains of "burning in the channel just where it enters the body." It comes on at 10 A. M., and continues more or less constantly throughout the day, except just after eating and when the attention is distracted by full and absorbing occupation. Five months previously he had gonorrhœa, for which he took injections so strong as to cause him "pain for hours afterward;" then he took "capsules," and got well in about a month. A month later, after drinking beer, he got a relapse, attended by "lumpy feelings" around the anus "like piles." This feeling was shortly followed by the "burning," the discharge having been arrested by capsules and injections, but the neuralgia continuing. He is troubled by sexual desires and frequent erections. Steel sounds had been passed by his physician without benefit. On exploration, the meatus admitted No. 15, but a bulbous bougie detected a linear stricture at three and a half inches, admitting only No. 13. This stricture had not been suspected. It proved very resilient, but the neuralgia got entirely well after dilatation. This patient had a curious reflex symptom—namely, distinct soreness of the mammæ, without structural change. This also got well as the urethra improved.

A condition of irritability of the neck of the bladder is sometimes left behind by gonorrhœa, attended by frequent desire to urinate, and sometimes a spasmodic action of the detrusor during micturition (neuralgia of the vesical neck). The urethra sometimes remains inelastic, causing a little dribbling. Both of the above sequelæ are overcome by hygiene and the steel sound.

Castelnau[2] mentions a singular condition of prostatic and urethral anæsthesia—the patient having no orgasm, and being unconscious of the passage of semen—left behind by gonorrhœa, and coinciding with an inflammatory engorgement of the urethra. The normal sensation returned after several months.

Various other unimportant functional troubles have been mentioned as sequelæ of gonorrhœa.

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[1] The disease formerly known as "*dry gonorrhœa*" is simply urethral neuralgia, coming on alone without any antecedent gonorrhœa—the canal not being inflamed, nor the malady, in any sense, a gonorrhœa.

[2] "Observation de Blennorrhagie suivie de Douleurs et d'Abolition de la Sensation agréable pendant le Coit" (Ann. des Mal. de la Peau et de la Syph.), 1844.

CHAPTER IV.

COMPLICATIONS OF GONORRHŒA.

Folliculitis.—Inflammation of Lacuna Magna.—Cowperitis.—Peri-urethritis.—Adenitis.—Lymphitis.—Gonorrhœal Rheumatism; Hydrarthrosis, Inflammatory; affecting Sheaths of Tendons; Bursæ.—Diagnostic Table of Simple and Gonorrhœal Rheumatism.—Gonorrhœal Ophthalmia.—Gonorrhœal Conjunctivitis.—Diagnostic Table of Gonorrhœal Conjunctivitis and Gonorrhœal Ophthalmia.

FOLLICULITIS.—During the acute stage of gonorrhœa, sometimes there appear along the urethra, especially in the region of the fossa navicularis, one or more small, round tumors, slighly sensitive to pressure, varying from the size of the head of a large pin to that of a pea. These tumors are cysts by occlusion of the mouths of the lacunæ of Morgagni. Inflammation seals the orifice of the follicle and the lacuna is converted into a cyst containing pus. As the latter continues to be produced, the cyst enlarges. The pain accompanying it is insignificant, and the little lump is detected by accident. It feels like a hard ball moving under the skin and attached by a pedicle. This pedicle is the obliterated neck and orifice of the follicle. The little tumor tends to remain stationary for some time, and then suddenly to enlarge, soften, involve the integument, open externally (very rarely into the urethra), and, after discharging, remain fistulous for a long time; not, however, communicating with the urethra. These tumors have been compared by Ch. Hardy,[1] who has described them very accurately, to wens of the scalp. The best treatment consists in incising the skin and enucleating the cyst entirely, or excising a considerable portion of its wall, allowing the wound to heal by granulation.

Another form of lacunal inflammation is where the lacuna magna in the roof of the urethra continues inflamed, perhaps after all the lining membrane of the urethra has returned to its normal condition. The mouth of this lacuna is too large to become obliterated, and the result is a gleety discharge, which tends to run on indefinitely. This condition may be relieved by introducing a fine director along the roof of the urethra until it is caught in the lacuna, and slitting open the pouch as recommended by Phillips.[2]

COWPERITIS.—Inflammation in and around Cowper's glands is rare. It seems to occur only in connection with urethral inflammation. Gubler[3] has written exhaustively on the subject. Cowperitis rarely comes on before the third or fourth week of gonorrhœa. Sexual intercourse, catheterism, and other irritations, have seemed to provoke it, but it may arise simply from extension of inflammation without appreciable immediate exciting cause. Only one gland is usually affected—by preference the left. Both may be (rarely) involved. The connective tissue around the gland is always largely implicated in the inflammation, making the disease mainly a peri-cowperitis.

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[1] "Mémoire sur les Abcès blennorrhagiques," Paris, 1864.

[2] "Maladies des Voies urinaires."

[3] "Des Glandes de Méry (vulgairement Glandes de Cowper), et de leurs Maladies chez 'Homme." Thèse, Paris, 1749.

The symptoms are, painful tension of the perinæum in the region of the bulb, increased by sitting, by pressure, by the friction of the pantaloons, slight swelling, with no change in color of the skin. On palpation, a small, deep ovoid or pyriform tumor is felt, the large end regarding the anus, the small end confounded with the bulb. It is about the size of a bean, on one side of the raphe, between the transverse muscle and the bulb. Soon the surrounding tissue becomes involved, and the tumor is completely masked. After this the phenomena are identical with those of perineal abscess. The inflammation often includes the scrotum. It is limited posteriorly by the transverse muscle of the perinæum, and usually crosses the raphe, but remains always more prominent upon the side where the inflammation began.

Constitutional sympathy depends upon the height of the inflammation. The abscess usually breaks externally. Its cavity is found to be partitioned, the compartments seeming to represent the lobules of the gland primarily affected. If the abscess open internally, urinary infiltration and fistula are to be feared. Hence the value of an early incision.

Simple cowperitis may undergo resolution. It is supposed that these glands are more or less inflamed in those cases of gleet accompanied by painful tension at the bulbous region. When peri-glandular inflammation ensues, suppuration seems inevitable. Gubler[1] cites a syphilitic gummy tumor of the perinæum, which occupied the exact position of Cowper's gland.

Treatment.—Early in the disease, absolute rest, fifteen or twenty leeches, over and around the painful spot, warm baths, a laxative, and an alkaline diuretic, constitute the treatment. If, in spite of these measures, suppuration comes on, it should be aided by poultices, and an early incision resorted to. The rule is, do not wait for positive fluctuation, which is difficult to detect through the hardened, inflamed perinæum. Pus has usually formed in one week. If it be not reached by the incision, no harm is done. The tissues will become disgorged, and whatever matter may subsequently form will find its way out through the incisions already made, which should be deep and thorough. If retention comes on, or is threatened, immediate external incision is imperative.

PERI-URETHRITIS terminating in abscess. Chordee is a peri-urethritis, but has little or no tendency to suppurate, and passes off during subsidence of the general inflammation. Suppurative peri-urethritis is rarely idiopathic. Its classical causes are gonorrhœa, or infiltration in connection with stricture. During gonorrhœa, suppurative inflammation may attack any portion of the spongy tissue around the urethra, but there are two points of election, the fossa navicularis, and the bulb. Anteriorly, peri-urethral abscess usually develops on one side of the frænum. It may commence centrally, bulge on both sides, and in this way be bi-lobed. At the bulb, the abscess begins centrally as a rule. Here the affection is far more serious. The whole perinæum becomes involved, the inflammation perhaps extending back to and around the anus. The root of the penis and the scrotum may also be included. Constitutional symptoms, usually absent with abscess at the fossa navicularis, are invariably present with abscess of the bulb, their intensity being proportionate to the grade of the inflammation. When a large extent of spongy tissue, anywhere along the urethra, falls into suppuration, constitutional sympathy is marked. These abscesses are only slightly painful at first, but they soon enlarge and become tender, being surrounded by a boggy œdema. They do not furnish the shot-like feel of the little pediculated cystic tumors of folliculitis.

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[1] *Loc. cit.*

Treatment.—An early deep incision is imperative, long before pus can be made out. If this is neglected anteriorly, traumatic hypospadias may result, while in abscess of the bulb the most serious consequences may ensue. The remarks made in relation to abscess attending peri-cowperitis apply with still more force here; ulceration into the urethra, retention, infiltration, burrowing of matter, with all their disastrous consequences are to be feared, if abscess of the perinæum breaks internally. None of these serious results are, however, inevitable. Should the abscess open into the urethra, the surgeon's duty is to watch, and only to interfere externally with the knife when urethral fever, pain, renewed swelling, and local tenderness, with tendency to the formation of other purulent collections near by, warn him that urine escapes from the canal, is burrowing, and requires an external outlet at once. In such a case, if there be no prominent point to incise (and any opening must be deep), it is better to perform external perineal urethrotomy, including, if possible, all fistulous tracts in the incision. The fistula may require subsequent attention. Abscesses (probably peri-prostatic), complicating gonorrhœa, occasionally occur behind the triangular ligament. These are liable to cause retention, may discharge into the urethra, or may be opened from the rectum after careful exploration.

ADENITIS.—A slightly painful enlargement of one or more inguinal glands is of quite common occurrence early in gonorrhœa. If the patient remains quiet for a time, the pain and engorgement usually disappear. Such glands exceptionally go on to suppurate. In the strumous, or markedly lymphatic, a certain amount of very persistent, indolent engorgement of the lymphatic glands may be brought on by gonorrhœa, and remain long after it. Should pus form, it is not auto-inoculable.

The treatment is, primarily, proper care of the urethral inflammation; for the adenitis, rest and the avoidance of all local irritation. If suppuration seems inevitable, a poultice and an early opening.

LYMPHITIS.—More or less lymphitis is a very common complication where urethral inflammation runs high. Several different forms are found. They have been well described by Fournier.[1] Where the lymphatic vessel alone is involved no pain is felt, nor does any external appearance attract the patient's attention. The finger, however, detects indurated cords under the skin, a dorsal trunk being usually the most prominent. The feel of these cords is exactly similar to that of the same vessels in the lymphitis of infecting chancre (Fournier). If there be peri-lymphitis, reddened streaks are seen upon the sides or back of the penis, and the corded lymphatics are felt hard, knotty, painful on pressure, often several of them matted together. They may be isolated by the fingers from the subjacent parts. There are painful tension of the inguinal glands and œdema of the prepuce.

The treatment is rest, emollient dressings (warm lead-water covered with oil-silk, poultice), warm baths, perhaps a few leeches in the groin. Occasionally abscesses form along the course of the hard cords. These should be opened early, as the pus is very apt to burrow, and may denude a considerable extent of penis.

Another form of lymphitis is that where the superficial lymphatics (not the trunks, although both may suffer together) become inflamed (erysipelatous lymphitis). Here a superficial redness, evenly spread out, involves the skin, which is swollen and very sensitive to the touch. This affection is often limited to the prepuce, which becomes œdematous and liable to phimosis. If the whole penis is attacked, fever runs high and the local distress is intense.

Treatment is the same as for lymphitis of the trunks. Resolution is the rule. Matter may form, however, and denude the penis. This may be prevented by early incisions. The indication for the knife is a porky, doughy, brawny condition of the integument, like that felt in phlegmonous erysipelas.

A hard œdema of the prepuce is often left behind by these different forms of lymphitis, especially in the neighborhood of the frænum, sometimes causing phimosis. Lymphitis may leave the lymphatic trunks in a varicose condition (Ricord), or lymphatic fistula mav result, usually requiring excision for its removal.

GONORRHŒAL RHEUMATISM.

At about the same time in the year 1781, Selle and Swediaur described an inflammatory articular affection as dependent upon gonorrhœa. Since then the writings of Hunter, Cooper, B. Brodie, Brandes,

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[1] "Nouv. Dict. de Méd. et de Chir. prat.," p. 185.

Bonnet, Diday, Rollet, Fournier, and others,[1] have established the fact that the connection between the two diseases is not a coincidence, but that a relation of cause and effect exists. The strongest proof of this relation lies in the fact that certain individuals, not ordinarily subject to rheumatic attacks, get a peculiar form of rheumatism when they get gonorrhœa. They remain well between the gonorrhœal attacks, but have a relapse of rheumatism whenever a new urethral inflammation is acquired. Brandes gives the history of such a case, where a fresh attack of rheumatism attended six successive gonorrhœas, and Fournier mentions a case of quadruple relapse. None of the ordinary causes of articular rheumatism seem to have any power in producing the gonorrhœal variety. It is not the effect of cold, or moisture, or fatigue; nor, indeed, does its immediate cause seem to be any modification in the discharge, or any medicine taken, or any injection used. The sole and only known exciting cause is an inflammation of the urethra, secreting pus, and there is a vague suspicion in the profession that there is something analogous to mild pyæmia about the condition.

When this complaint has once complicated a gonorrhœa, the chances are that every succeeding urethral inflammation will be attended by its rheumatism, in spite of all efforts to keep it off. Fortunately all patients with gonorrhœa are not liable to this complication—a small minority only is affected. An ordinary patient with gonorrhœa, even having a pronounced rheumatic diathesis, may expose himself to cold, moisture, and fatigue, without getting any rheumatism; or, if he does get an attack, its course is not varied nor its symptoms modified by the coexistence of urethral discharge.

It is, then, an individual idiosyncrasy which causes a patient with gonorrhœa to develop rheumatism, and not any tendency to suffer from the latter complaint.

Women possess a strange immunity from gonorrhœal rheumatism. They do suffer from it, but only exceptionally. It is supposed that the explanation for this may be found in the fact that the vagina and not the urethra is the usual seat of gonorrhœa in the female.

Gonorrhœal rheumatism resembles rheumatic gout more than rheumatism. The local inflammatory character of the symptoms is usually inconsiderable, and the constitutional sympathy is not of a severity proportionate to the trouble in the joints.

The date of appearance of the rheumatic complication from the beginning of the urethral discharge is variable. It has been noticed as early as the fifth day, but usually does not come on till a later period. Fournier places the usual date of the outbreak between "the sixth and fifteenth day," rarely during the second or third month, or at any later period. The old idea, that the rheumatic complication is the result of a metastasis of the gonorrhœa, is untenable. There is no diminution of the discharge previous to or coincident with the invasion of the rheumatism, and there exists no indication to increase the urethral flow and thus "save the synovial membranes." The discharge is not usually at all modified, although it is sometimes notably diminished a few days after the rheumatic symptoms have set in—which may be explained by the fact that the rheumatism keeps the patient more at rest, or, by the revulsive action which any intervening inflammatory affection is liable to exercise over a purulent discharge. Where the complication comes on late in a clap, it has been observed that its advent is preceded by an exacerbation of the discharge for a few days.

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[1] For bibliography, *see* Art Médical, November and December, 1857, vol. vi. "Observations et Matériaux pour servir à l'Histoire de l'Arthropathie blennorrhagique," Ch. Ravel, and Fournier, *loc. cit.*

The seat of the disease is variable—joints taking the first rank; the synovial sheaths of tendons and muscles the second; then coming synovial bursæ and nerves. The eye not infrequently suffers. The pericardium (Brandes) and meninges of the brain and cord (Ricord) seem to be involved occasionally. Concerning the joints, Fournier tabulates one hundred and twenty cases, of which thirty-nine are his own. The whole number of joints affected in these cases was two hundred and twelve; the knee eighty-three times—over two-thirds of all the cases; ankle, thirty-two times—about one fourth; fingers and toes, twenty-five times—about one fifth, etc. The large joints, particularly the knee, are by far the most often involved, and, when the smaller joints suffer, they do so consecutively. The disease is rarely absolutely confined to a single joint; but still it shows a marked tendency to be mono-articular. Fournier's division of the disease into three prominent varieties is convenient and practical.

The first form—a common one—is a hydrarthrosis, attacking usually the knee, sometimes the ankle or elbow. This form is generally mono-articular. It comes on insidiously; but the effusion into the joint, which is usually considerable, may take place rapidly. The pain is slight, but is increased by walking, running, or moving the joint. There may not be enough pain to call the patient's attention to his joint, although this is unusual. The integument over the affected region preserves its color, and there may be no constitutional disturbance. The affection tends to remain indolent, and to undergo resolution slowly, lasting sometimes many months.

The second form is more like ordinary rheumatism. More or less local and general febrile reaction is the rule, and this form is usually poly-articular and liable to be attended by trouble in the tendons, eyes, etc. The symptoms are like those of ordinary rheumatism, only more moderate. The pain, at first severe, is usually notably modified by rest—far more so than is the case with ordinary rheumatism. Constitutional symptoms occur; but the fever is moderate, and subsides after a few days, while the local disturbance continues. This relative lack of proportion between the constitutional and the local symptoms is a strong diagnostic feature of the malady in question. When only one joint is affected, there is sometimes a total absence of general symptoms. When several joints are involved, they become so, as a rule, consecutively. The malady, however, does not become so general as it does in ordinary rheumatism. It is more stationary, less mobile, does not jump from one joint to another. When a new joint is involved, those previously affected continue to suffer—with, of course, occasional exceptions. Resolution is even more tardy than in ordinary rheumatism. A secondary hydrarthrosis, rare in simple rheumatism, is not uncommon in the gonorrhœal variety. The sweating, so constant in simple rheumatism, does not occur, even where there is a good deal of fever, or, if it does come on, it is of short duration. The acid concentrated state of the urine, found in simple rheumatism, is not noticed, nor does the blood show the same excess of fibrine. Finally, the pericardium, endocardium, pleuræ, etc., are very rarely involved.

Slow resolution is the usual termination of the disease, but articular pains, or very persistent stiffness, may be left behind; or, more rarely, chronic hydrarthrosis, chiefly of the smaller articulations (Brandes), anchylosis, or even white swelling—the latter only in lymphatic or scrofulous patients (Sordet). Acute suppuration does not occur (Fournier).

The third form which the affection may assume is that of vague, ambulatory—sometimes very persistent—pains in joints, which do not appear to have suffered any structural alteration, and of which the function is undisturbed—the knee, wrist, shoulder, foot, and jaw. This pain, which may be the only symptom, is rebellious to treatment, and, after it has gradually subsided, is apt to return, if from any cause the amount of urethral discharge becomes increased.

The synovial sheaths of the tendons of the extremities may be affected, either alone, or, more commonly, in connection with whatever joints are involved. There are tumefaction along the course of the tendon, redness of the integument, occasionally very intense, if the tendon be superficial, severe pain on pressure, and partial or entire abolition of the movement of the muscle belonging to the tendon involved. This affection, like the others, undergoes gradual resolution. Hot local anodyne fomentations are indicated.

The bursæ may also suffer. In this case we have an acute or subacute hygroma, which is peculiarly painful and sensitive to pressure for a long time. Two bursæ seem most liable to the attack, the one lying between the tendo-Achillis and the os calcis, and the other situated beneath the inferior tuberosity of the same bone. This explains the pain in the heel, so often complained of by these patients—alluded to by Swediaur. Other bursæ suffer, but more rarely.

The acute symptoms accompanying inflammation of bursæ usually yield rapidly to local depletion and sedatives; later a blister. Fournier[1] mentions a case of gonorrhœal hygroma of a bursa over the ischium, which he saw with Verneuil. The symptoms attending it were so severe as to lead these gentlemen to a diagnosis of deep suppuration. They made preparations to incise the swelling, when a sharp pain suddenly appeared in the knee. The operation was postponed. In a few days the hygroma disappeared "with surprising rapidity," while the knee-joint became acutely inflamed.

Evidences of muscular rheumatism may attend the symptoms of rheumatic trouble elsewhere. The nerves do not always escape. Fournier observed sciatica five times among his thirty-nine cases. Diplopia (Fournier), deafness (Swediaur, Fournier), and little superficial collections of serum near the affected joints (Fournier, Ricord, Féréol), have been mentioned as rare occasional complications. The following excellent table, arranged by Fournier, gives at a glance the characters distinguishing gonorrhœal from ordinary rheumatism:

Gonorrhœal Rheumatism.	*Simple Rheumatism.*
1. Cause.—Urethral inflammation. No influence of cold in the production of the rheumatism.	1. No etiological relation with the state of the urethra. Habitual causes—cold, inheritance, rheumatic diathesis, etc.
2. Very rarely observed in women.	2. Common in the female, although less frequent than in the male.
3. Non-febrile, or much less so than simple rheumatism. Even in acute cases, reaction never attains the habitual intensity of rheumatic fever.	3. Reactional phenomena much more intense and prolonged than in gonorrhœal rheumatism.
4. Symptoms habitually limited to a small number of joints. The affection never becomes general to the same extent as simple rheumatism.	4. Symptoms usually involve a number, sometimes nearly all, the articulations.
5. Less movable than simple rheumatism, going from one joint to another less quickly. No delitescence, no real jumping from one joint to another.	5. Symptoms, movable — ambulatory fluxions; rapid delitescence, jumping from one joint to another.
6. Local pains generally moderate, always less than in simple rheumatism. Sometimes remarkable indolence.	6. Pains always rather intense, sometimes excessive, disappearing less rapidly than those of gonorrhœal rheumatism.
7. Frequently a tendency to hydrarthrosis, following the acute fluxion.	7. Little or no tendency to consecutive hydrarthrosis.
8. No sweating.	8. Abundant sweats, constituting a symptom almost essential to the malady.
9. Urine not modified.	9. Urine specially modified.
10. Blood not furnishing a marked buffy-coat.	10. Blood forming a firm concave clot with buffy-coat.
11. Cardiac complications very exceptional.	11. Cardiac complications frequent.
12. Frequent coincidence with a special ophthalmia, inflammation of the synovial sheaths of tendons, inflammation of bur-	12. Acute rheumatism does not affect the eye; the bursæ escape, as do usually the sheaths of tendons.

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[1] *Loc. cit.*, p. 237.

Gonorrhœal Rheumatism.—(*Continued.*)	*Simple Rheumatism.*—(*Continued.*)
sæ, etc. The latter localities may be exclusively implicated.	
13. Relapse in the course of successive gonorrhœas very frequent.	13. Relapse frequent, but always independently of the state of the urethra.

Treatment.—The ordinary treatment for rheumatism or rheumatic gout is not applicable. Local measures are of the first importance. Internal treatment is hygienic and rational, cod-liver oil, iron, quinine, tonics if required, and alkali, if the urine is over-acid, etc. The specific remedies for gonorrhœa are without effect over the rheumatism, but nevertheless the urethral inflammation must be treated without interruption. As a rule, the sooner the urethra returns to a normal condition, the more effective will be the means used against the rheumatism. Often, however, the latter will outlast the former; but, at least, a relapse may be averted. On no account should the urethral inflammation be rekindled, if it shows a tendency to subside; this practice has become obsolete by general consent. In all forms of the complaint, rest is of the first importance. During the more acute manifestations, the affected joint should be immovably fixed in a wire or other splint, and kept at perfect rest. Fifteen or twenty leeches locally applied, followed by hot narcotic fomentations, will usually speedily reduce pain, and bring the malady to a subacute stage. A cathartic at the beginning will leave the patient more comfortable. The diet should be low while the patient is confined. After the more acute symptoms have subsided, and especially where there is effusion, the joint should be covered by a large blister, followed by another as soon as the skin is dry, and perhaps a third. The blisters may be dressed with cerate, containing four or five grains of morphia to the ounce. As soon as pressure can be borne, the surface should be thoroughly painted with iodine, and firm pressure applied by means of adhesive straps encircling the joint, the whole limb, of course, being snugly bandaged. Obstinate cases, which resist treatment, are greatly benefited by a snugly-applied starch or plaster bandage. Suspension of the functions of a joint is of the first importance in bringing about resolution. Colchicum and iodide of potassium are rarely of any service. In chronic cases, and for the articular and muscular pains, Russian and Turkish baths, with local douche, friction, and massage, render valuable service.

GONORRHŒAL OPHTHALMIA.

There are two forms of ocular trouble caused by gonorrhœa. The first is rheumatic in character, nearly always (Ricord, Fournier), but not invariably accompanied by other signs of gonorrhœal rheumatism, having no connection with contagion as a cause, and affecting the membrane of Descemet, the iris, or the conjunctiva.

The second form is conjunctivitis, depending always upon contagion.

The distinction between these two affections should be kept constantly in view.

RHEUMATIC GONORRHŒAL OPHTHALMIA.—To Abernethy, Mackenzie, and particularly Ricord, is due the credit of having first accurately described this affection. It is generally associated with the poly-articular variety of gonorrhœal rheumatism. It may precede, or follow, the development of rheumatism elsewhere. Contagion will not produce it. Its essential cause is the existence of a urethral discharge. According to Fournier, it is more frequent than gonorrhœal conjunctivitis, as 14 to 1; cold, fatigue of the eye, etc., have no power to produce it. An individual idiosyncrasy seems to preside over its appearance. Should it occur with one urethral inflammation, the chances are that it will reappear with the next. It is far more common in the male than in the female. Sometimes it appears to exercise a revulsive action upon the joint trouble, and *vice versa*, the one disappearing to be replaced by the other, but this exceptional. The rule is contained in Brandes's assertion, "There exists no other relation between gonorrhœal ophthalmia and gonorrhœal rheumatism than one of coexistence."[1] In brief, gonorrhœal ophthalmia is a localization of gonorrhœal rheumatism upon the eye, all the rest of the body (perhaps) escaping.

Symptoms.—Inflammation of the membrane of Descemet (aquo-capsulitis) is the most common form of attack. Here the conjunctiva is only moderately injected, the cornea is transparent, but more than usually prominent. A cloudy, smoky appearance of the fluid of the anterior chamber is the most characteristic objective symptom. Sight is slightly troubled, objects looking misty. There is no pain, but sometimes a sensation of uneasiness about the eye. Photophobia is absent or very mild. Sometimes there is a slight flocculent deposit on the posterior face of the cornea, with the escape of a little blood into the aqueous humor (Cullerier). The iris is unaffected, perhaps a little slow in its movements. There is no deformity of the pupil, no change in color of the iris, no other sign of iritis—points strongly insisted on by Cullerier.[2]

When the iris is attacked, the symptoms do not differ from those of simple iritis; redness of the cornea, radiate peri-corneal injection, contracted deformed pupil, sluggishness or abolition of the movements of the iris, change of color, effusion of lymph into the pupil, plastic deposits in the anterior chamber, more abundant in gonorrhœa than in ordinary iritis (Mackenzie), obscurity of vision, photophobia, lachrymation, peri-orbital and occular pains.

Fournier has described a rare *conjunctival form of gonorrhœal ophthalmia*. There are simple conjunctivitis, injection of the conjunctiva, uniform, or marked at certain points—the secretion is scanty, muco-purulent. There are slight, perhaps no lachrymation, a little itching about the eyes—sometimes absolutely no pain, photophobia, or alteration of vision, no symptom of iritis or of aquo-capsulitis.

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[1] "Du Rheumatisme blennorrhagique" (trans.), "Arch. Gén. de Méd.," 1854.

[2] "Des Affections blennorrhagiques." Leçons cliniques publiées par Eugéne Royet Paris, 1861.

These varieties of ophthalmia, unlike the contagious conjunctivitis, are rarely mono-ocular; when so, the form is usually iritis. Both eyes are rarely attacked simultaneously. After one has recovered, inflammation may attack the other, run its course, and then return to the eye first involved. To get the disease the patient himself must have gonorrhœa, unlike the conjunctivitis of contagion, which may be produced in any healthy individual by the mere contact of gonorrhœal pus.

Gonorrhœal ophthalmia runs a rapid course, declining with unusual speed. It may last several weeks, or only a few days. Relapse is not infrequent. Of the three forms, conjunctivitis is the least harmful, aquo-capsulitis is not grave; the iritis alone is liable to leave trouble behind in the shape of adhesions.

Treatment is mainly expectant. The eye must be kept at rest in all cases. The best local applications are emollient lotions and collyria frequently used, warm water or steam—with atropine, in case of iritis. Astringent collyria are useless, even harmful. Irritating pediluvia, the judicious use of revulsive cathartics, and a low diet, constitute the general treatment. If the symptoms prove obstinate, the frequent application of small mild blisters to the temples and forehead is of service. In mild cases, patients do better if not confined. They may even attend to business, if the eye be kept covered. In severe cases, housing is necessary, local emissions of blood may be practised, and repeated purgation should be resorted to. When the peri-orbital and frontal pains are severe in iritis, large doses of quinine seem to be of service, with the local inunction of belladonna-ointment, or of a liniment composed of ol. menth. pip. four parts, chloroform and liq. ammoniæ, of each one part: or—

℞. Chloroform: tr. opii: ol. oliv., āā q. s. M.

If the pains persist, in spite of these measures, codeine or morphine may be used at night, by the stomach, or subcutaneously.

Gonorrhœal Conjunctivitis.—This terrible malady is fortunately rare. Its sole and only cause is contact of gonorrhœal pus with the conjunctiva. It has no other relation with gonorrhœa than this, and may affect the surgeon or the nurse as well as the patient, provided only a little of the contagious pus touch the conjunctiva. Hence the necessity of forewarning patients of the danger they run in neglecting the most scrupulous cleanliness of the hands after dressing the penis, using injections, or passing water. For the surgeon, this precaution is equally necessary, together with the other one of burning all pieces of sponge, linen, lint, etc., which are brought into contact with gonorrhœal pus, derived either from the urethra or the eye. If this be neglected, the subsequent use of the sponge on a healthy eye may carry the contagion to it, and give rise to a dangerous malady.

This disease is truly a gonorrhœal conjunctivitis, and is easily separable from gonorrhœal ophthalmia, a disease impossible upon a given subject unless he is at the same time himself suffering from urethral inflammation. The so-called sympathetic (metastatic), gonorrhœal ophthalmia is of the latter variety, and should never be confounded with true contagious conjunctivitis.

Gonorrhœal conjunctivitis is rare; of 37,034 cases of disease of the eyes treated at the New York Eye Infirmary, it occurred 59 times, once in 628 cases (Bumstead). It is much more frequent in the male than in the female, on account of the greater opportunities for contagion. The right eye suffers more often than the left, since most patients handle the penis, and rub the right eye, with the right hand. Pénanguer[1] states the proportionate occurrence of the disease in the eyes to be four times in the right to once in the left.

The symptoms are those of purulent conjunctivitis intensified. The rapidity with which the symptoms aggravate is often appalling. The slight dry sandy feeling attending the first congestion of the eye is of the shortest duration, as is the secretion of tears and muco-pus. Within a few hours after contagion, the dischage is frankly purulent, and the inflammatory symptoms go on increasing rapidly in severity, until, in three or four days, often sooner, destruction of sight is inevitable. Sometimes the safety of the eye is compromised in a few hours (ten to twelve). The vessels of the conjunctiva rapidly fill with blood, and its tissues become distended with serum (chemosis). The border of the infiltrated conjunctiva overlaps and partly conceals the cornea, the latter lying, as it were, at the bottom of a cup filled with pus. The eyelids have an erysipelatous redness, are very œdematous, and swollen. The upper overrides the lower. There is spasm of the orbicular muscle. Pus is retained in large quantities. Pain, ocular and peri-orbital, is often intense. The cornea soon falls into ulceration, if the chemosis continue. There is, first, a purulent infiltration between its lamellæ, then softening and ulceration, superficial at first, and usually situated near the circumference of the cornea, perhaps obscured from casual inspection by the overhanging, chemosed conjunctiva. This ulceration progresses rapidly to perforation, the aqueous humor escapes, perhaps hernia of the iris occurs. The cornea may be pressed out into an anterior staphyloma, or be destroyed by the ulcerative process, or fall out, as a whole, like a watch-glass, allowing the contents of the eye to escape. The general symptoms are moderate. Fever is usually mild, except in rare cases of suppuration of the globe, and soon gives place to a nervous, depressed, irritable condition, attended by insomnia, agitation, inquietude, more rarely stupor.

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[1] "De l'Ophthalmie blenṇorrhagique." Thèse, Paris, 1851.

Diagnosis.—The following table, prepared by Fournier,[1] sets forth the distinguishing characteristics of the two ocular affections, liable to be found upon a patient with a urethral discharge. The distinctions cannot be too strongly insisted upon, on account of the liability to confusion of two conditions, one of which is so harmless and so little benefited by remedies, the other so destructive and so positively under the control of treatment.

Gonorrhœal Conjunctivitis.	*Gonorrhœal Ophthalmia.*
1. Essential cause—inoculation of the conjunctiva with gonorrhœal pus.	1. Contagion plays no part in the production of the malady, which is developed under the influence of an internal cause, the nature of which is unknown.
2. A rare affection.	2. An infrequent complication of gonorrhœa, but still much more common than the contagious ophthalmia :: 14 : 1.
3. May affect subjects not suffering from gonorrhœa.	3. Only attacks patients already suffering from gonorrhœa.
4. Usually only one eye involved.	4. Commonly both eyes.
5. The symptoms are those of the gravest kind of purulent ophthalmia. They affect the conjunctiva primarily.	5. The symptoms are those of an inflammation of the membrane of Descemet, of an iritis, or of an oculo-palpebral conjunctivitis.
6. Symptoms fixed, not going from one eye to the other.	6. Sometimes the inflammatory phenomena are mobile, passing from one eye to the other.
7. No tendency to relapse in subsequent gonorrhœas.	7. Frequent relapses in the course of subsequent gonorrhœas.
8. No coincidence with rheumatic manifestations.	8. Coincidence with gonorrhœal rheumatism very habitual, almost constant.
9. Prognosis excessively grave. Often loss of the eye.	9. Prognosis without gravity.
10. The eye is only saved by a most energetic treatment.	10. Expectation, or the simplest treatment, sufficient for a cure.

Prognosis.—When a severe purulent conjunctivitis develops in an individual with a urethral discharge, or even in a friend, especially if any history of contagion can be elicited, the prognosis is most grave. Unless an energetic treatment be instituted, the eye is lost, and, if aid come a little late, some lesion of greater or less severity and affecting vision is pretty sure to remain behind. Fortunately, both eyes are rarely involved.

Treatment.—There is not a moment to be lost. Delay may sacrifice the eye. The essentials of treatment are four:

1. Relief of tension.
2. Relief of chemosis.
3. The early free repeated use of a strong cauterant.
4. Cleanliness.

Each of these four is about equally important.

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[1] "Nouv. Dict. de Méd. et de Chir. prat.," p. 251.

The greatest care is necessary in handling the tender, swollen eye. No pressure is allowable. The dressings should be the lightest possible—even the pressure of the swollen lids upon the eye is prejudicial, and must be met by early, free canthoplasty at the external angle, an operation to be repeated if necessary. All the dressings should be performed by a skilled hand, else they will be inefficient. The utmost care should be used in protecting the sound eye from contagion. It may be hermetically sealed with lint and collodion where the nurse is not trustworthy. Old soft rags are most suitable for wiping off the discharges, and these should be destroyed at once by fire. The pus retains its contagious properties for hours after it has dried, and fresh pus has been found to be still contagious when diluted with one hundred parts of water. The rapid and virulent nature of the inflammation occasioned by the contagion of gonorrhœal pus has been amply demonstrated by certain oculists, who have treated pannus by inoculating the eye with this material for the purpose of exciting an acute inflammation.

If the patient is seen early, before his symptoms have run high, and before the secretion is frankly purulent—within the first twenty-four, at most forty-eight hours—if he is robust, it is advisable to take three or four ounces of blood from the temple, or mastoid process of the affected side, by leeches or cups. If the effect seem favorable, this local blood-letting may be repeated in ten or twelve hours, and even a third time if necessary. Irritant purgatives, and a low diet at first, are of advantage. Perfect rest of body, and, if possible, of mind, should be secured. The sick-room should be obscurely lighted.

If the patient is not robust, not an ounce of blood can be spared, a laxative rather than a cathartic should be given, while the diet must be nourishing and supportive, even stimulating if there be much depression. Under no possible circumstances is a mercurial course advisable, or a continued depressing treatment harmless.

The local treatment is the same for all cases. If the patient is seen very early, iced-water is to be applied locally upon a thin fold of cloth, which must be constantly changed. As soon as pus begins to form, a solution of gr. x to xx of nitrate of silver should be painted over the conjunctiva, and the iced-water continued. Every few hours the eye must be reinspected, and the nitrate-of-silver solution reapplied. As pus begins to form more abundantly, or if the patient is not seen until suppuration is profuse, the strength of the solution must be increased up to ʒ j to the ℥ j, or the solid stick may be employed, being carefully drawn over the entire ocular and palpebral conjunctiva. The cornea is of course spared in applying any caustic. After using strong solutions of the nitrate of silver, the excess should be washed away with a solution of common salt.

The object of these powerful applications is, to restrain the formation of pus and change the discharge into a sero-sanguinolent one.

They should be made sufficiently often, and sufficiently strong to produce this effect. The iced-water compress should be kept up for a number of hours after each application, then the lids should be anointed with cold cream, and left uncovered, simply shaded from the light. Cauterization should be repeated whenever the discharge gets abundant and thickly purulent.

The water or cerate will keep the outside of the eye reasonably clear, but the swelling of the lids and spasm of the orbicular muscle tend to confine much of whatever discharge there may be. Hence the value of canthoplasty. It allows dressings to be made easily, prevents the ball from suffering pressure (thus contributing to preserve the cornea), and makes cleanliness easy. The outer canthus should be continued by an incision down to the bone. A skilled nurse from time to time should gently separate the lids, and squeeze a few drops of warm water into the eye from a soft rag, removing all external pus with the same cloth. A syringe should not be used to wash the eye, for fear of spattering. A mild solution of nitrate of silver, gr. v to x, is sometimes of advantage, dropped into the eye between the cauterizations. The treatment must be continued unremittingly, the eye, being washed, dressed, and inspected, every two or three hours, until the symptoms abate. An anodyne may be required, to produce sleep.

Chemosis is treated by extensive and deep scarifications performed with the curved bistoury or scissors. These scarifications must be thorough. They should never be made before, always after a cauterization, otherwise the surgeon will have to wait some time for hæmorrhage to cease, or he will not apply his cauterization thoroughly, and, furthermore, an unnaturally hardened condition of the conjunctiva is liable to be left behind by the healing of the scarifications, the surfaces of which have been cauterized down to the bottom. Some of the chemosed conjunctiva may be snipped away, but deep scarification with a bistoury, often repeated, is better.

When the cornea becomes opaque, use atropine at once, and, without waiting for ulceration, puncture the anterior chamber, repeating this operation as often as the cornea becomes tense. It is better to do this, especially if there be ulceration, than to run the risk of hernia of the iris, or possible escape of the contents of the globe.

Peri-orbital pains are combated as are those of gonorrhœal ophthalmia (p. 87).

When the acuteness of the symptoms begins to subside, milder astringent collyria may take the place of the nitrate of silver; such as—

	℞. Alum exsic.,	gr. vj–xij to the ℥j.
or—		
	℞. Zinci sulph.,	gr. j–iij " " "
or—		
	℞. Sodæ biborat.,	gr. v–x " " "

These may be applied to the eye by means of any of the ingenious "droppers" which the shops afford, or, if the patient can slightly open and close the lids, he may diffuse the solution over his eye by throwing back the head until the plane of the face becomes horizontal, then closing both eyes, and dropping a little of the solution (not too cold) over the inner canthus of the one to be medicated. Now, by several times rapidly opening both eyes to their widest extent and then shutting them, the fluid enters the eye and circulates over the globe. This method does not succeed with strong solutions, causing pain, and should not be used with solutions which stain the skin. Nitrate of silver should always be applied by an experienced hand, and be brought into contact with every portion of the conjunctiva.

The inflammation once reduced to a subacute state, tends to get well slowly. The discharge drags along on an average for from two to four weeks—often longer. In these cases blisters behind the ears, on the temples, seton at the nucha, etc., have been recommended, together with plenty of good food, fresh air, tonics, stimulants, etc.

Granular conjunctivitis and anterior staphyloma may be mentioned as not very rare complications of gonorrhœal conjunctivitis. They have no essential connection with gonorrhœa, and the student is referred for their treatment to works on diseases of the eye.

CHAPTER V.

STRICTURE OF THE URETHRA.

Definition.—Varieties: Muscular, Organic.—Organic Stricture.—Form.—Number.—Seat.—The Lesion in Stricture.—Causes.—Time of Occurrence of Stricture.—Irritable and Resilient Stricture.

An unnatural narrowness of any portion of the canal of the urethra constitutes stricture; or, since the urethra is naturally a shut canal, Sir Charles Bell's definition may be more accurate, and any loss of dilatability may be termed stricture. This contraction of the canal, following the first definition, to constitute stricture, must be unnatural, for the urethra has certain points of normal contraction—namely, the meatus and the beginning of the membranous urethra, and these are not strictures. They become so, however, if they are unduly small. Thus, an individual with an average-sized penis and urethra, whose meatus will only take No. 8 or 9, has stricture (congenital) of the meatus, although he may never suffer any inconvenience therefrom. Again, any inflammatory condition of the walls of the canal, or spasmodic contraction of the same, constitutes stricture, as does also any growth upon or beneath the mucous membrane—cancerous, tubercular, syphilitic, membranous, polypoid.[1]

A collection of fluid outside the canal may constitute stricture, abscess, serous or hydatid cyst, etc.—any thing, in short, which lessens the size of the canal when distended by the stream of urine—foreign bodies of course excepted. In all the last-named conditions, however, stricture is only an epiphenomenon, and not the disease itself.

In this section, pure stricture only will be discussed.

Stricture is of two kinds: 1. Muscular, or spasmodic; 2. Permanent, or organic—the latter congenital, or acquired. Inflammatory stricture does not exist as a disease of the urethra. The smallest amount of inflammation will lessen the calibre of the canal, just in proportion to the amount of turgescence of the mucous membrane; but this is unimportant. No amount of simple inflammation of the urethral mucous membrane gives rise to enough diminution of the size of the canal to occasion serious inconvenience (retention), unless occurring in connection with organic stricture, assisted by muscular spasm or complicated by prostatic congestion. A croupous membrane may exist within the urethra and obstruct more or less the flow of urine; but this is exceedingly uncommon. Rokitansky[2] speaks of "very rare cases" where "we find primary croup occurring on the urethral mucous membrane"—this chiefly in children. Membranous deposits may occur upon the surface of organic stricture, or behind it; but these are not to be confounded with true croup.

1. Muscular or Spasmodic Stricture.—Spasmodic stricture is of the commonest occurrence; but, as in the case of inflammation, unless complicating preëxisting organic stricture, it is usually an affection of no special importance. The predisposing cause of spasmodic stricture is a sensitive, high-strung, nervous organization, often in connection with an irritable, gouty, or rheumatic constitution, and particularly in those whose sexual functions are not regularly exercised. The exciting causes are any local irritation, inflammation, foreign body, irritation of the rectum (reflex action), ingestion of certain substances, cantharides, turpentine, etc., mental emotions, malaria. The seat of contraction is in the unstriped muscular fibres which surround the urethra at the irritated point (stricture, foreign body), or at the membranous urethra in the voluntary "cut-off" muscle.

The action of many of these causes may be readily illustrated. Take a nervous, excitable young man with a healthy urethra—*a fortiori*, with an irritable bladder or inflamed urethra—and attempt to pass a bougie for the first time, and the chances are that it will be arrested. It may be grasped and firmly held at any part of the canal, but this is more liable to occur just as the instrument is entering the membranous urethra, where its point may be detained for many minutes by an involuntary contraction of the cut-off muscles. If the end of the sound is held quietly for a few moments against the contracting muscle, the spasm will yield and the instrument pass on into the bladder. Any foreign body in the urethra is liable to excite this amount of spasm around it. If any portion of the canal is in a state of irritation, especially if slight organic stricture exist (this is a potent cause of spasm), some contraction is almost certain to take place at this point on the approach of an instrument, and to recur after the sound has passed along, giving the sensation of "grasping" or "biting" upon the instrument, which is so well marked in most strictures.

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[1] (Polypi very rarely grow in the spongy urethra. They are chiefly found—discovered after death—in the prostatic sinus; sometimes in the fossa navicularis, where they can be felt and seen during life. Their symptoms are those of stricture. When within reach, they may be excised or torn away, and the base from which they grow cauterized. They seem always to spring from the floor of the urethra.—Beyran, "Polypes de l'Urètre chez l'Homme."—*Gaz. Méd.*, 47, 1863.)

[2] Sydenham translation, vol. ii., p. 235.

The spasm caused by cantharides is attended by a good deal of congestion as well. It is styled strangury—a term too well known to require further comment.

What surgeon has not witnessed spasmodic stricture, caused by modesty or shame, perhaps anxiety, fear, irritated mind (Cooper), as shown by the total inability of some patients to pass water before a class of students or even in the presence of a physician alone in his office.[1] In such cases there is not a failure of the detrusor urinæ to contract, but there is failure of the compressor urethræ to relax. The patient contracts his abdominal muscles and his diaphragm, and uses all his will, but to no purpose. Let the surgeon now gently introduce a well-warmed and oiled catheter of medium size into the bladder, and the spirt that will follow, as soon as its eye touches urine, will easily convince him that there is no fault to find with the contraction of the detrusor.

Whether malaria alone can cause spasmodic stricture is doubtful, but certainly there are two cases on record[2] where spasmodic stricture occurred paroxysmally every twenty-four or forty-eight hours, and was cured by quinine after other means had failed.

As instances of spasmodic stricture from neighboring irritation and reflex action, may be cited retention coming on suddenly in connection with inflamed hemorrhoids after operations near the anus, especially where the sphincter ani has not been paralyzed by section or stretching; retention occurring with irritable ulcer, or even from worms. Thompson, quoting Tuffnell,[3] gives a case where all the symptoms of stricture existed, and where a diagnosis of stricture of the membranous urethra was made, when it was discovered that the patient had tape-worm. The latter was treated, and after the worm had been discharged the stricture and its symptoms disappeared.

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[1] In one (personal) case, from this cause, a patient waited one hour and a half before he could pass water, and that too in a closet adjoining the office with the door partly closed. His bladder was moderately full, he had no organic stricture, and was doing his best.

[2] Thompson, *op. cit.;* and B. Brodie, *Medical Gazette*, vol. i., p. 107.

[3] *Dublin Medical Press.*

Strongly concentrated acid urine may occasion spasmodic stricture in a gouty individual, attended by more or less congestion—perhaps positive inflammation—and this all the more readily if there be a small amount of organic stricture.

Certain forms of lumbar neuralgia attended by painful spasmodic contraction of the urethra have been described by Neucourt.[1]

DIAGNOSIS.—Spasmodic stricture always occurs suddenly, the stream of urine between the paroxysms being of normal size. This difference is sufficient to distinguish it from organic stricture where the stream is permanently small.

Treatment consists in the discovery and removal of the cause, paying special attention to sexual irregularities, the gouty diathesis, concentrated urine, and points of congestion, or commencing organic stricture in the urethra. Retention produced by simple spasm can always be relieved by the hot bath, rest, and an opiate, or at once by an anæsthetic and the catheter. Belladonna seems powerless.

PERMANENT OR ORGANIC STRICTURE.—Congenital stricture has been described (*see* ATRESIA). Here we have to do with organic stricture, the result of a previous pathological process.

FORM OF STRICTURE.—All strictures may be ranged under three heads: (*a*) linear, (*b*) annular, (*c*) tortuous.

(*a.*) *Linear Stricture.*—Here the stricture is like what would be caused if a thread were tied around the canal (Fig. 24); or it may consist of a thin membranous diaphragm, with its orifice at the centre or on one side; or be a crescentic fold or free band, encircling the urethra entirely or partially in a transverse or oblique direction. It is single or multiple.

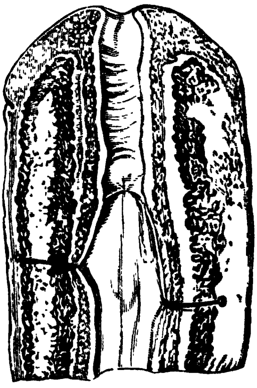
FIG. 24.—(*Voillemier.*)

(*b.*) *Annular Stricture.*—This form is broader, as if a flat tape had been tied around the canal (Fig. 25). The term is applied to strictures not over a quarter of an inch long.

(*c.*) *Tortuous or Irregular Stricture.*—Here all other varieties come in. Such a stricture may be an inch or more long—even the whole pendulous urethra may be in a hardened, stiffened, narrowed condition.

The amount of contraction in stricture varies from an almost imperceptible narrowing of the canal to nearly absolute occlusion, so that, after death, it may be impossible to introduce even a bristle through it. Absolute occlusion does not occur except after the canal has been severed by an injury, and the urine has found an escape through the wound; or where numerous large fistulæ have long existed, giving exit to all the urine. The urethra in front of a stricture always continues pervious, whether urine pass through it or not; although, from lack of habitual distention, its walls are liable to become somewhat rigid, sensibly diminishing the normal proportions of the canal.

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[1] *Archiv. Gén.*, July, 1858.

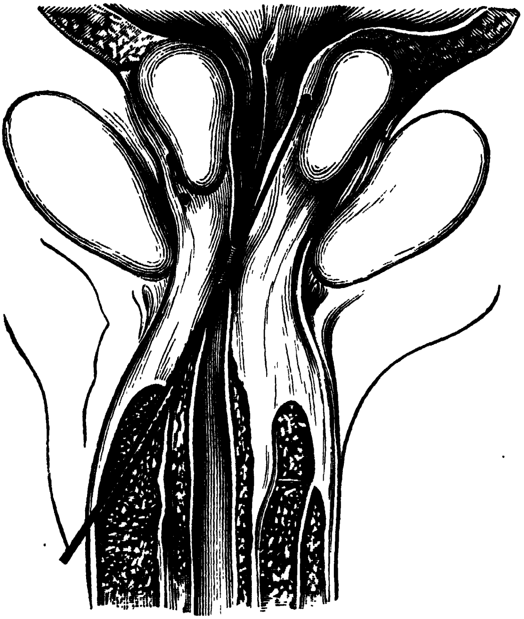

FIG. 25.—(*Dittel.*)

NUMBER OF STRICTURES.—Stricture is usually single. Out of two hundred and seventy preparations, showing stricture, found in the museums of London, Edinburgh and Paris, Thompson[1] found, in two hundred and twenty-six cases, solitary stricture. Hunter saw, in a single urethra, six; Lallemand, seven; Colot, eight; Leroy d'Etiolles, eleven—the latter on a living subject. Thompson has seen three—at most four—and believes that if more are found they must be considered as irregular contractions of the same stricture.

SEAT OF STRICTURE.—Upon this subject the laborious investigations of Thompson, upon the two hundred and seventy specimens above referred to, must be considered final, especially as daily experience with patients bears out the truth of his conclusions. He divides the urethra into three regions:

1. The bulbo-membranous, including one inch in front of and three-

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[1] "Stricture of the Urethra," third edition, 1869.

quarters of an inch behind the junction of the spongy with the membranous urethra.

2. From the anterior limit of region one, to within two and one-half inches of the meatus, embracing from two and one-half to three inches of the spongy urethra.

3. The first two and one-half inches of the canal from the meatus.

The two hundred and seventy preparations showed three hundred and twenty strictures.

Region 1 contained 215 strictures—67 per cent.
" 2 " 51 " 16 "
" 3 " 54 " 17 "

There were 185 cases of one stricture only, situated in region 1.
" " 17 " " " " " " 2.
" " 24 " " " " " " 3.

Thompson did not find in any preparation, or upon any living patient, or in any autopsy, a prostatic stricture. Walsh[1] describes a stricture in the museum of the Royal College of Surgeons, Dublin, as commencing in the posterior part of the membranous and extending into the prostatic urethra. Leroy d'Etiolles[2] says that he has in his collection one specimen showing prostatic stricture. Ricord[3] narrates that he has encountered it, and Civiale[4] makes the same assertion. In brief, the situation of organic stricture is as follows: Most frequently in the bulbo-membranous urethra, sometimes as far back as the posterior part of the membranous portion—that is, at a distance varying from four and one-half to six and one-half inches from the meatus. Next in the first two and one-half inches of the canal, usually just at the meatus, or at the posterior limit of the fossa navicularis, and finally at some intermediate point in the spongy urethra. Prostatic stricture, formerly considered so common, may be said practically never to occur. The frequency of stricture at the bulb and fossa navicularis is explained by the greater vascularity of these portions of the canal, and the greater amount of erectile tissue found there. It is well known that gonorrhœal inflammation tends to settle upon these localities, after the rest of the mucous membrane has returned to its normal condition. Injury inflicted by the rough use of the nozzle of a syringe, in injecting the canal, probably has something to do with the subsequent formation of stricture near the meatus. Traumatic stricture most often invests the membranous urethra, just beneath the sub-pubic ligament.

THE LESION IN STRICTURE.—The morbid change in organic stricture may be a mere thickening of the mucous membrane, the surface having lost its polish, being congested, and perhaps covered with granulations.

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[1] *Dub. Med. Press*, January, 1856.

[2] "Des Rétrécissements de l'Urèthre," Paris, 1845, p. 83.

[3] Notes to Hunter on Venereal, second edition, Philadelphia, 1859, p. 168.

[4] "Maladies des Organes genito-urinaires," sec. ed., Paris, 1850, vol. i., p. 158.

These changes are the result of chronic inflammation, and resemble those which occur in any tegumentary structure of the body which is kept in a condition of mild chronic inflammation; namely, there is a proliferation of cellular connective-tissue elements and a consequent proportionate increase in the thickness, density, and inelasticity of the membrane. This process takes place just within and beneath the mucous membrane, and not on its free surface, as shown by A. Guerin,[1] who states that, in one hundred autopsies of patients with gonorrhœa, more than one-half of whom had stricture, he found the morbid process in these latter always to have acted immediately beneath the mucous membrane and in the spongy tissue. If the stricture is a little more extensive, a few whitish transverse fibres will be found encircling the canal, beneath the mucous membrane. If more advanced still, the meshes of the spongy tissue will be found glued together, obliterated, and a mass of dense, fibrous, callous material encircling the canal and holding it permanently contracted. This tissue may be slight in extent, cicatricial in character, tightly contracted, or it may be exuberant, knobbed, and excessive in amount, so that it may be readily felt from the outside of the canal, having a cartilaginous or even woody hardness. In this callous, fibrous mass, the microscope detects no yellow, elastic fibres (Thompson).

Flaps, valves, and free bands, adhesions, etc., are formed by atrophy of follicles, or of portions of submucous tissue; or the bands may be caused by the use of instruments in the canal—perforating a flap, for example.

CAUSE OF STRICTURE.—Omitting congenital and other varieties of stricture already alluded to (cancerous, etc.), organic stricture is always caused by inflammation or a traumatism. Inflammation of the urethra is the most common cause, whether this be simple urethritis or gonorrhœa; but the latter is far oftener followed by stricture, and that simply because the inflammation is more severe and more continued. Of two hundred and twenty cases of stricture studied critically by Thompson, one hundred and sixty-four (seventy-five per cent.) owed their origin to gonorrhœa. The longer the duration of a given gonorrhœa the more certain is it to be followed by stricture. This is almost surely the case where gonorrhœa prolongs itself indefinitely in the gleety stage, the latter condition being nearly conclusive proof of forming stricture. Gonorrhœa attended by chordee is more apt to be followed by stricture than are those cases where this complication does not exist. Should the chordee be "broken," stricture becomes inevitable, and that too of the traumatic sort. Any thing connected with urethral inflammation which indicates that the morbid process has extended outside of the mucous membrane, and has invaded the delicate meshes of the erectile tissue around the canal, warns us of coming stricture. The plastic exudation, as it is called, once effused, glues the meshes of erectile tissue permanently together, and the cell-proliferation, starting with the urethral inflammation, goes on after the latter has ceased, making new fibroid material, of which the tendency is steadily and more and more to contract. Cicatricial tissue manifests this tendency to contract and obliterate the canal, even more strongly than the tissue formed by cell-proliferation after inflammation. Linear longitudinal incisions do not occasion stricture. Whatever contraction occurs in them, when they unite without loss of substance, being in a longitudinal direction, would tend rather to increase than diminish the calibre of the tube; hence no stricture follows operations for stone (properly performed). Transverse incisions, on the other hand, are always followed by more or less stricture (Reybard).[1] If the incision only just open the canal, the amount of stricture will be inappreciable. If the urethra be partially severed, its upper wall being left intact, the contraction and subsequent stricture will be only partial, proportionately to the degree of section, and retention from such a stricture might never occur. When, however, the whole canal is divided across, then stricture, going on steadily to retention, is inevitable. Thus we may have a traumatic stricture giving scarcely any or indeed no symptom, and detected only by accident during a careful examination, although this is so rare as to be nearly hypothetical. For, even if only a portion of the floor of the urethra be cut across, yet the upper wall rarely escapes bruising, or injury of some sort, which may involve it in a chronic inflammation and overgrowth, causing it to assist in the formation of the stricture starting below. If the edges of a urethral wound slough from any cause, the subsequent stricture is by so much the more considerable.

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[1] *Loc. cit.*, p. 125.

Any injuries of the canal, involving loss of substance, produce stricture. To this class belong urethral chancres and ulcerations, gangrene from crushing or following phlegmonous erysipelas or infiltration, ulcers produced by prolonged pressure, stone, retained catheter, etc.

But classical traumatic stricture, such as it is the rule to encounter in practice, is formed most often low down in the canal (farther from the meatus than strictures produced by clap), involving the membranous urethra, and generally caused by a crushing injury to the perinæum. The urethra in this region is particularly exposed to contusions. It is fixed and cannot get out of the way, and the sharp edge of the sub-pubic ligament has a great deal to do in the causation of the injury.[2]

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[1] "Traité pratique de Rétrécissements du Canal de l'Urètre." Argenteuil Prize, 1852.

[2] In January, 1866, assisted by Dr. Gouley, I endeavored to demonstrate, upon the urethra of the cadaver, the effect of blows inflicted upon the perinæum with a bluntish instrument. The subjects were placed upon the back, the legs moderately separated, and the blow administered by Dr. Gouley, standing over the cadaver, and using the broad base of a common axe. The effect of the blow was always found, upon subsequent dissection, to have expended itself upon the urethra, directly beneath the edge of the sub-pubic ligament. The injury inflicted varied with the force of the blow. The bulb was always contused, but, unless the force of the blow was considerable, the mucous

The injuries which have been reported as causing traumatic stricture in the perinæum, with or without a penetrating wound, are innumerable. Among the most classical may be mentioned falls from a height, the patient lighting astraddle a beam, a chair, a stump, a manger, the limb of a tree, the corner of any blunt object, a trunk, a box, etc.; falls astraddle a fence while walking upon it, of a wheel while mounting an omnibus, of the tongue of a wagon; falls upon a sharp object, as a chisel, the breakage of a chamber-pot upon which the patient has been sitting; falling with one leg through a hole in the ice, or down a coal-hole in the sidewalk; being thrown forward upon the pommel of a saddle, while riding; fracture of the pelvis, kicks in the perinæum from man, woman, child, or beast, etc., *ad infinitum*. This, perhaps, unnecessarily minute detail of injuries capable of causing stricture is given, because they are all occurring constantly. The authors have seen cases from each cause, and very many from some of them. They are very liable to be overlooked by the patient when, at the time, they do not give rise to hæmorrhage or retention. The injury is often slight, not causing much immediate disturbance, and the patient forgets it; he never has a gonorrhœa, perhaps, and yet in after-years symptoms of stricture come on, and the canal is found highly contracted at its membranous portion; or, in trying to relieve retention in fever, the physician finds his catheter unexpectedly arrested. In these cases, a strict inquiry into all antecedent injuries of the perinæum should be made, in order to get all the information possible upon the nature of the stricture.

Traumatic strictures are particularly liable to be sensitive, irritable, and resilient, and usually require harsher means of treatment than ordinary dilatation, and the employment of more persistent and intelligent measures to prevent recontraction afterward, than most strictures from other causes. Hence the imperative importance, in these cases, of insisting upon an intelligent use of the full-sized steel sound by the patient himself, for an indefinite period of time after cure—generally for the remainder of life; a task certainly irksome and disagreeable, but no more so, and no less necessary, than a truss to the ruptured, spectacles to the weak-sighted, an artificial leg to replace an amputated one, and certainly more necessary and less irksome than the daily use of the razor.

The only treatment of gonorrhœa which may cause stricture is the use of injections. The nozzle of a syringe, if long or roughly used against an inflamed mucous membrane, may irritate it sufficiently to keep up local inflammation, until it becomes chronic, and passes on to that cell-proliferation and thickening which constitute stricture. Linear strictures of the first half-inch from the meatus are doubtless often caused in this way. Secondly, too strong injections may cause stricture,

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membrane of the membranous urethra escaped injury. Sometimes the membranous urethra beneath the sub-pubic ligament was partially lacerated, and sometimes totally severed; but this required a very forcible blow.—VAN BUREN.

usually situated from two to four inches down the canal, rarely lower. The *rôle* of injections in producing stricture has been doubtless overrated; probably none of the fluids ordinarily used are able to occasion it, unless employed of very unusual strength. But, granting that gonorrhœa alone is amply sufficient to cause stricture, yet it is a singular coincidence, to use no stronger term, that most patients possessing particularly tight resilient stricture, not due to injury, but yet behaving as if they were traumatic, with a very sensitive, hyperæsthetic urethra in front of them—that most of these patients have used strong injections of the nitrate of silver, in attempted abortive treatment, or with the idea of "burning out" the disease—injections strong enough to bring blood freely, often to be followed by several hours of severe urethral pain. As a general rule, it may be stated that any injection strong enough to produce either of these two results (blood or subsequent prolonged pain) is capable also of originating organic stricture. The opinions of the profession, regarding the instrumentality of injections in causing stricture, have varied. Formerly it was believed that injections of all sorts produced stricture; but soon it was noticed that, although no injections were employed, still stricture continued to follow gonorrhœa. Then all *rôle* of causality was denied to injections, of whatever nature, and however used. But a pretty extensive experience seems to justify the placing of the truth between the two extremes, attributing the bad effects of the remedy only to its excessive strength, nitrate of silver being most often to blame.

TIME OF OCCURRENCE OF STRICTURE AFTER GONORRHŒA AND INJURY.—Of the 164 cases of stricture following gonorrhœa, tabulated by Thompson, in 10, symptoms appeared immediately after or during the attack; 71, within one year; 41, between three and four years; 22, between seven and eight years; 20, between eight and twenty-five years. J. D. Hill,[1] from 140 cases of stricture from all causes, makes the length of the period, between the cause and the first symptoms of stricture noticed, to be: after gonorrhœa, shortest period two years; longest, thirteen years—after urethral chancre, shortest period ten months; longest, three years—after injury, shortest period four months; longest, eighteen months. The statement in the latter table of statistics, doubtless literally correct, tends to mislead. Ater a traumatism, of the crushing kind, to the perinæum, for instance, the classical course of events is as follows:

From œdema and effusion of blood, at first, there is more or less obstruction to the flow of urine; perhaps, if the canal is severed, there is retention. If the latter has not occurred, inflammation comes on, and the size of the stream is still further diminished. Now inflammation subsides and repair begins, and, with this repair, contraction goes hand-in-hand. Consequently, after a transverse or crushing wound of the urethra, where repair begins *stricture commences. It may not manifest itself by retention, or, indeed, by any symptom which the patient observes for four months or for several years, but it is there none the less.*

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[1] "An Analysis of 140 Cases of Stricture of the Urethra," London, 1871.

If the injury has been slight, or the canal only partly involved, no appreciable symptom may occur for years (ten or twelve), as when boys have been kicked at school, have fallen on a fence, or been thrown upon the pommel of a saddle. The point of importance is this: traumatic stricture comes early because the violence causing it is greater (usually) than the violence of simple inflammation of the urethra. Let the violence be trifling, and the interval may be exceedingly long.

With this understanding, then, the deductions to be drawn from the above statistics are confirmed by daily observation: namely, that the symptoms of stricture appear earlier after a traumatism than after gonorrhœa, the date of their appearance measurably proportionate to the extent of the injury, and that the greatest divergence is noticeable after gonorrhœa. It is totally exceptional, however, for symptoms of organic stricture to come on "immediately after or during the attack" of gonorrhœa—as Thompson states occurred in ten of his cases—unless stricture existed previous to the attack, unnoticed by the patient, as sometimes undoubtedly occurs (*see* Case X.).

IRRITABLE AND RESILIENT STRICTURE.—A stricture is said to be irritable when it is sensitive, easily excited to inflammation from slight causes, rebellious to the use of instruments, fretting as it were under their employment. A resilient stricture (so named by Syme) is one which, without being necessarily irritable, is elastic, India-rubber-like, contracting quickly after being dilated, sometimes to an extent greater than existed before the use of the dilating instrument (*see* Case XV.). Traumatic strictures are sometimes of this type, as are strictures following strong injections of nitrate of silver.

CHAPTER VI.

STRICTURE OF THE URETHRA.

Instruments and their Use.—Filiform Bougies with Manœuvres alone, and as Guides.—Bougies.—Bulbous Bougies.—Catheters.—Sounds.—Scale.—Advantages of Steel Instruments.—Instruments for Divulsion with Manœuvres.—Instruments for Internal Urethrotomy with Manœuvres.—Perineal Urethrotomy with and without a Guide.—Rectal Puncture.—Supra-pubic Puncture.—Dieulafoy's Aspirator.

BEFORE passing to the diagnosis, symptoms, and treatment of stricture, it is better at once to describe the instruments to be used, the methods of manipulating them, and the operations in which they are employed, in order to avoid endless repetition.

Great mechanical ingenuity has been displayed in the construction of instruments for the detection and treatment of stricture. Such of them will be mentioned as are considered best suited for these objects. Space will not allow a description of more than the type instruments of each class.

The instruments which it is necessary for the surgeon to possess in order to be able to meet the requirements of all cases of stricture are: different varieties of bougies, sounds, and catheters with a scale; instruments for divulsion, internal and external urethrotomy; trocars, canulæ, and an aspirator.

BOUGIES.

FILIFORM OR HAIR-LIKE BOUGIES are such as measure one millimetre or less in diameter—size No. 2 (one millimetre diameter) being the smallest size that can be accurately measured on a scale-plate. There are three varieties of filiform bougie: the French, English, and whalebone. They are all made conical, narrowing down to a fine point, and gradually increasing for an inch or two until the full size of the shaft is reached. The whalebones are olive-tipped.

FRENCH FILIFORM BOUGIES are of three varieties. They are black, and made of a gummy material spread smoothly over a woven frame. Some are entirely so composed, and in choosing these it is well to select the stiffest. Others are furnished centrally with a fine copper or lead wire running down to the point. These can be bent and twisted into spiral form at their extremity, to facilitate introduction, and avoid lacunæ and false passages; while in the third variety (Benas bougies) the central wire is replaced by a fine whalebone shaft to give it greater firmness.

Of these bougies, the first named, those without any central shaft, are often provided with a little metallic cap upon one end, furnished with a female screw, so arranged that it may be screwed upon the end of another instrument. By means of this ingenious device, when one of these bougies has been made to penetrate a stricture, and has reached the bladder, some other instrument which it is desirable to use for rupturing or incising the stricture, or drawing the urine, may be screwed into it and then pushed forward, following its guide through the stricture into the bladder. The filiform bougie coils up in the bladder, doing no harm there, and is withdrawn with the larger instrument. The device is due to Maisonneuve; it has been largely applied by others.

Yellow English filiform bougies are used in the same manner. Two cautions are necessary in regard to the employment of this species of urethral guide:

1. The little metallic cap upon the bougie should always be examined before it is used, to make sure that it is firmly attached to the bougie. They become loosened by time, and, if a defective instrument be used, there is danger of leaving the bougie behind in the bladder.

2. If the stricture be very tight, it will sometimes happen that, after the instrument, which has been screwed into the bougie, has followed its guide up to the strictured point, the metallic cap of the latter will refuse to enter there; the bougie will double up just in front of the cap, and, if force be used, a false passage will be made alongside of the stricture. The English bougies are stiffer and less liable to this accident than the French.

The deduction is, use the utmost gentleness in following the guide into the bladder, and, if the screwed instrument does not run smoothly along, desist, and choose some other plan for overcoming the obstacle.

Soft filiform bougies are also constructed two feet long, to serve as guides, by being introduced into the bladder, and then threaded through a soft French gum-elastic catheter open at both ends (Fig. 26). Over such a guide a catheter may sometimes be safely conducted into the bladder. The same device is employed by the French in the shape of a small flexible catheter, provided with a filiform point eight inches long. The point is introduced as a filiform bougie, and the catheter pushed after it into the bladder. This is equivalent to the other device of a conical catheter, so arranged as to screw into an armed (screw-tipped) filiform bougie (Fig. 27).

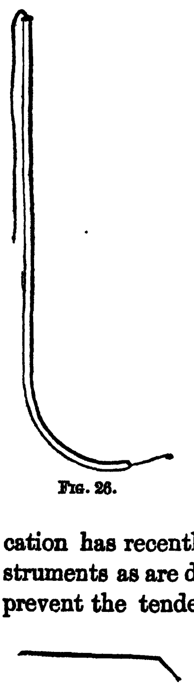
FIG. 26.

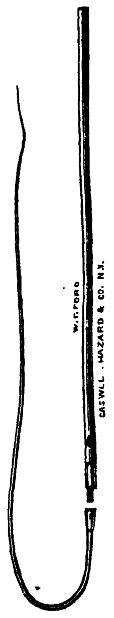

FIG. 27.

THE ENGLISH FILIFORM INSTRUMENTS are a little stiffer than the French. They are of a yellow color, made of a woven fabric, and covered with varnish. A modification has recently been introduced into such of these instruments as are designed to serve as conductors, in order to prevent the tendency to double up in front of the stricture in the manner above narrated. This modification consists in the insertion of a piece of whalebone into the axis of the instrument for an inch or more in front of the cap, so as to give it additional firmness at this point.

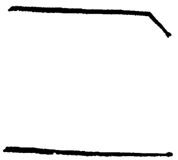
FIG. 28.

WHALEBONE FILIFORM BOUGIES are thin, hair-like strips of whalebone, very smooth, conical, with slightly bulbous points. By dipping them into hot water, the end may be variously shaped (an expedient employed in difficult catheterism in the last century)—twisted into spiral, bent into zigzag (Fig. 28), a modification which is of vast assistance in threading tortuous strictures and escaping false routes and lacunæ.

The instrument may be rotated during its passage, and its point be thus presented at different portions of the circumference of the canal, so as finally to engage it in the orifice of the stricture. These bougies, about two feet long, are also used as guides for larger instruments, not by being screwed upon them, but threaded through a metallic loop made for the purpose, upon the under side of the instrument which they are to guide—an adaptation of Desault's principle—the latter being known as "tunneled" instruments.[1] Whalebone instruments are easy of introduction, and capable of rendering most important service as guides, but three cautions are necessary in their employment for this purpose:

1. The guide should be two feet long. No cracked, bent, fissured, or frayed-out instrument should ever be used.

2. In employing a whalebone as a guide, it should be first introduced into the bladder, then threaded into the instrument to be guided, and the latter pushed gently down to the strictured point, while the whalebone is held stationary at the meatus. If force be used here, the slender guide may double up and a false passage be made; but this may always be avoided by gently and continuously retracting the guide, as the conducted instrument is passing the dangerous point, and until it reaches the bladder. The length of the guide (two feet) easily allows this to be done.

3. The loop of the instrument to be conducted should always be amply large, and be smoothed off in front so as to have a rounded and not a cutting edge; and, if the movement of extracting the guide, as the tunneled instrument is being introduced, cannot be performed as above described, both instruments should be withdrawn; for, if the one be pushed forward forcibly, or the other pulled back, there is danger of cutting off a portion of the whalebone and leaving it in the canal—an accident which has occurred in very competent hands.

Whalebone bougies may be made of any size. The larger ones are useful in treating strictures situated in the pendulous portion of the canal. Gutta-percha bougies should never be used in the urethra. They become brittle by age, and are liable to break.

MANŒUVRES.—Regarding the method of introducing filiform bougies, a few words will suffice. Their fine points are liable to catch, chiefly in the lacuna magna (Fig. 8), but also in any of the numerous sinuses of Morgagni, in any false passage, or against membranous bands and folds of the urethra, in the tortuous turnings of a stricture, or in the softened reticulated membrane behind it (Fig. 29). With the whalebone bougie—often with any filiform instrument—these obstacles may be generally surmounted. There are two special manœuvres for accomplishing this:

1. When an instrument catches, partially withdraw and slightly

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[1] Refer to note under "Perineal Section with a Guide."

rotate it, pushing it forward while making the rotatory movement. *This device rarely fails in finally engaging the instrument in the orifice of the stricture, especially if the filiform point be bent or twisted in any direction (spiral, zigzag), so that its extremity may lie outside of the axis of the shaft of the instrument* (Fig. 28).

2. An excellent method of finding the orifice of a stricture, especially where false passage exists, consists in cramming the urethra full of filiform bougies, engaging their points in all the lacunæ and false passages, and then trying them, one after another, until that one is pushed forward which is presenting at the orifice of the stricture, when it will at once engage.

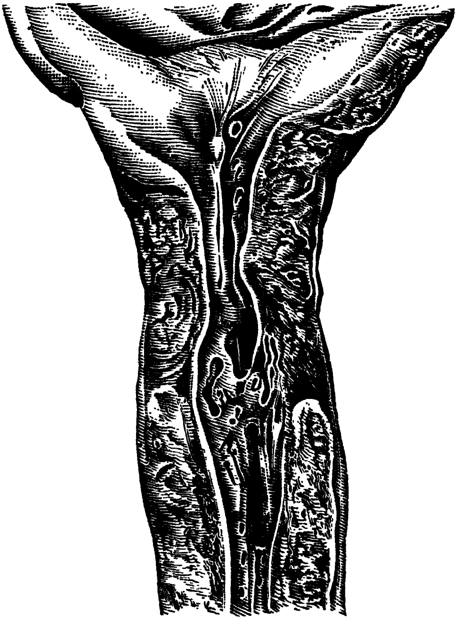

Fig. 29 (*Dittel*).—Showing Lacunæ and False Passages in which the Points of Filiform Instruments are liable to be caught.

The use of filiform bougies in threading tight strictures is greatly facilitated by first injecting the urethra full of warm oil. Filiform bougies, intelligently used, make impassable strictures the greatest rarities in a surgeon's practice.

Bougies.—Of other bougies (not filiform) the French and English conical only need be described—the blunt are not useful, nor are the olive-tipped of as much service as the simple conical. French conical bougies are black, woven, and covered with gum. They come of all sizes, and are necessary in the treatment of stricture up to size 8 or 10. The olive-tip is of advantage in the large, objectionable in the small sizes. When choosing olive-tipped bougies, preference should be given to such instruments as are rather stiff, but have a long, slender, flexible neck, supporting the bulb. When held vertically, bulb upmost, and touched upon the olivary tip, the neck should yield at once (Fig. 30, *A*). Such an instrument will guide itself safely and override obstructions.

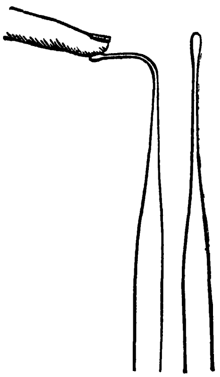

FIG. 30—*A*.

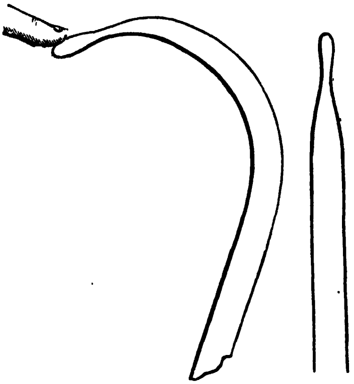

FIG. 30—*B*.

The olivary points found on the English conical bougies are useless, as far as any advantage derived from the bulb is concerned, from a neglect to make the neck of the instrument flexible (Fig. 30, *B*).

English yellow bougies are smoother and stiffer than the preceding. They keep much better in the changeable climate of New York. All of the foregoing instruments are introduced without a stylet, by simple direct pressure with (perhaps) rotation.

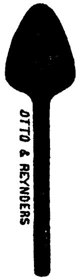

FIG. 31.

THE BULBOUS BOUGIE (*bougie-à-boule*) is an instrument essentially necessary for the accurate diagnosis of stricture. They are found of French and English make. The latter are apt to be too stiff. They consist of a flexible, woven shaft, headed by an acorn-shaped extremity, of a diameter much greater than that of the shaft. They are sized according to the diameter of the head. A set of them, running from 3 to 20, is required. Any thing too tight for 3 (1½ mill. diam.) may be said, practically, only to admit a filiform instrument (size 1). In choosing bulbous bougies, they should be selected with nicely conical short head and an abrupt shoulder (Fig. 31).[1] Instrument-makers have them of all varieties, with very pointed, even oval heads and no shoulders—occasionally with two or three bulbs. These are not useful. For economy's sake, an instrument with fixed curve has been constructed of steel, having a small shaft, and terminating in a screw upon which may be screwed acorn-shaped heads of different sizes, also of steel. This instrument is better than no bulbous sound at all, but not much superior to an ordinary blunt sound. It is too clumsy for delicate manipulation. Metallic bulbs on slender wires are better, equally durable, and excellent for the pendulous urethra; but the woven French instrument is more delicate, and the best for all cases.

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[1] For the method of using the bulbous bougie, *see* DIAGNOSIS OF STRICTURE.

It may be said at once, of all woven instruments, that the English are more durable and easier to keep than the French. The latter will not stand the heat of a New York summer, unless specially protected. They soften and stick to each other and to the case in which they are kept—thus becoming ruined. This may be prevented by dusting them with French chalk or keeping them in a cool place, in hot weather.

CATHETERS.

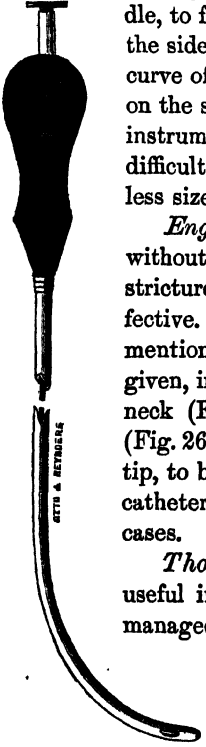

FIG. 32.

Silver catheters do not wear out, and it is well to have a case of them on hand, of short curve, from size 7 to 14. They should be made slightly conical, and have a flattened wooden or other handle, to facilitate manipulation, marked with its number on the side of the handle corresponding to the concavity of the curve of the instrument. The handle should be immovable on the shaft, at right angles to the plane of the curve of the instrument (Fig. 32). No one not accustomed to manage difficult cases can use a silver catheter without a guide of a less size than No. 6 without risk of false passage.[1]

English yellow elastic catheters of small sizes, conical, without bulbous point, may be useful in the treatment of stricture where the expulsive power of the bladder is defective. Three varieties of French flexible catheter may be mentioned: the flexible olivary, particular attention being given, in choosing the instrument, to the flexibility of the neck (Fig. 30 *A*); the flexible catheter, open at both ends (Fig. 26); and a flexible instrument armed with a metallic tip, to be screwed upon a filiform guide (Fig. 27). All soft catheters should be introduced without a stylet, in ordinary cases.

Thompson's probe-pointed catheter is an instrument very useful in skilled hands, very dangerous if not judiciously managed. It is made of silver, from size No. 3 to any size desired. It is conical, and should be eleven inches long. Those of English make are too short. The last two inches beyond the eye are of solid soft silver, much smaller in size than the shaft of the catheter, and slightly olivary at the tip; in fact, it is a malleable silver probe upon the end of a small silver catheter. The probe may be bent to any desired curve. For greater security, a rod of metal, exactly filling the calibre up to the solid probe-point, may be screwed into the catheter, making it practically a solid silver probe-pointed sound (Fig. 33). There seems to be some danger of the breaking of this instrument at the eye, unless care be used in bending it. Consequently it has been modified by Otis, by being made hollow through-

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[1] Nothing short of fracture of the penis, where compression is needed, will justify the tying into the urethra of a metallic instrument for more than a day or two at most. If

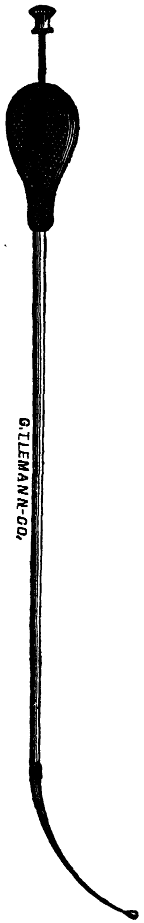

FIG. 33.

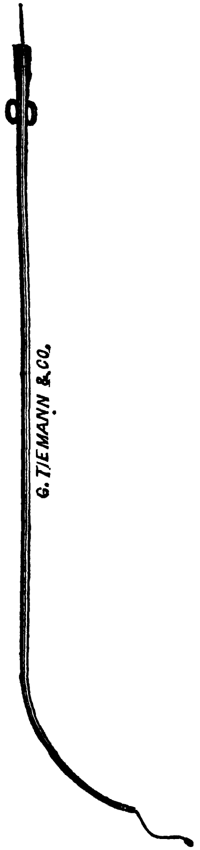

FIG. 34.

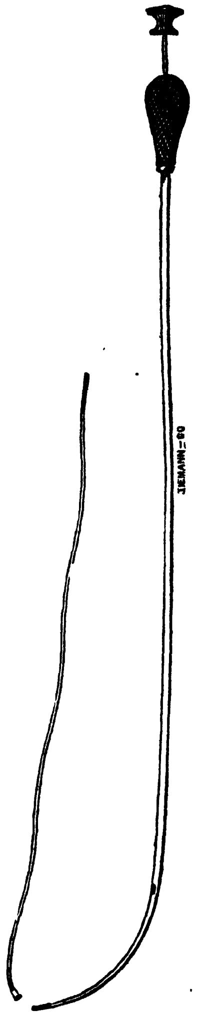

FIG. 35.

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this rule be neglected, ulceration of the urethra is a necessary consequence, the points of greatest ulceration being at the peno-scrotal angle—under the suspensory ligament—at the meatus and in the bladder, where the point of the catheter touches.

out, open at its tip, and with a wire exactly filling up the whole canal. The eye at the tip is the main advantage, since the instrument may be used over a whalebone guide two feet long (Fig. 34). As suggested by Bumstead, this instrument may be used screwed upon a filiform soft bougie (Fig. 35). All solid instruments having a fixed curve are introduced as is the sound (p. 32).

SOUNDS.

The most necessary instrument for the treatment of stricture is the steel sound; for, whatever means be used to cure the stricture, rarely can that cure be maintained without the help of the sound.

Steel sounds are conical or blunt. It is well to have a set of both kinds, but the former only are necessary. They should be made of the short curve (page 31), that one which is based upon the natural curve of the fixed part of the healthy adult urethra. The hardest steel is used in their construction. They are capable of a high degree of polish, and are smoother than any other instruments used in the urethra, metallic or soft. The conical instruments to compose a set run between Nos. 9 and 20 inclusive. The conicity of No. 9 runs through four sizes (that at its point is No. 6), of No. 10 11, 12, 13, through five sizes, of No. 14 through six, and all other instruments, from No. 15 on, run through seven sizes, the largest instruments going through over eight and nine numbers, the full size of the instrument being in every case reached just at the end of the curve. Thus No. 16 would measure 10 at its tip, penetrate 11 of the scale-plate for a distance of about four lines, penetrate 12 for about half an inch, 13 for an inch, 14 for an inch and a half, 15 for two inches, and, gradually enlarging around the curve, just fit 16 as the shaft becomes straight (Fig. 36).

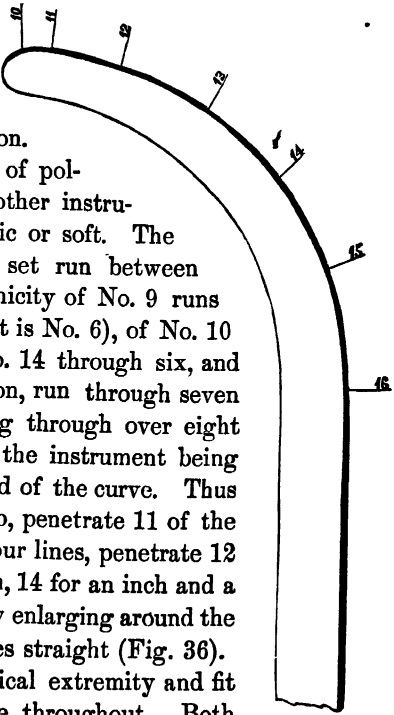

FIG. 36.—The mark —16 is placed in the plate a little too far from the point.

Blunt instruments have a spherical extremity and fit the same aperture of the scale-plate throughout. Both instruments measure—shaft and curve—about nine inches, the flattened handle two and one-half inches. Upon this latter the number is stamped, and, if desired, the diameter of the instrument and the corresponding French size. Small conical sounds with a tunneled extremity are serviceable, with a whalebone filiform bougie as a conductor (Fig. 37).

SCALE.

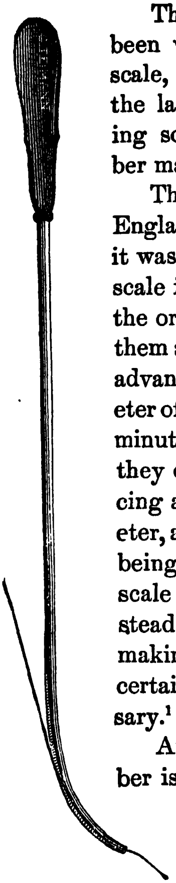

FIG. 37.

The scale for grading the sizes of instruments has never been very accurately fixed, except in France. The English scale, which has been, until recently, the favorite wherever the language was spoken, is arbitrary and inaccurate, varying so much that instruments marked with the same number may be found to differ two millimetres in diameter.

The tendency of late years, in this country as well as in England, has been to adopt the French scale, simply because it was fixed and immutable. The only valid objection to this scale is, that it involves too many instruments in a case for the ordinary surgeon, entailing needless expense in procuring them and care in keeping them in order, with no compensating advantage, since *with conical instruments* the increase in diameter of only one-third of a millimetre for a size is unnecessarily minute. If the profession were still using blunt instruments (as they do largely in France), then the French scale—commencing at No. 1 with an instrument one-third millimetre in diameter, and going to No. 30, ten millimetres in diameter, each size being one-third millimetre larger than the one below it—such a scale would undoubtedly be the proper one to follow. Bumstead has adopted it, but is obliged to advise the student, in making up his case, to procure only every other size between certain limits — the intermediate numbers being unnecessary.[1]

An increase of one-half millimetre diameter for each number is the best rate of progression for conical instruments, and it is this feature which characterizes the American scale. No. 1 is one-half millimetre in diameter. This is an appreciable size, it is easy to remember as a starting-point, whence on each following number is one-half millimetre larger in diameter—*ad infinitum.* All instruments below No. 2 are filiform—*not capable of accurate measurement on a scale.*[2]

On the plate are marked off the size and diameter of each instrument (Fig. 38), and on the other side (Fig. 39) approximately the corresponding size according to the French scale. The scale stops at 21, simply because an instrument of that size is often wanted, but very rarely any thing higher. As a rule, no conical instrument of metal should be used in the urethra without a guide of a size less than No. 9, the point of which is very small (No. 6). In passing a conical instrument,

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[1] *Op. cit.*, p. 316.

[2] As instruments of less than 1 mill. diam. cannot be accurately measured on a scale plate, it was at first decided to make this size No. 1; and the earlier copies of this work so represent it. The change is made to facilitate a reduction to French sizes. As now arranged, any size can be expressed in its corresponding French number, by adding to it one-half of itself. 10 Am. = (10 + 5) 15, 20 = 30, 7 = 10½. French numbers are made American by subtracting one-third: 30 Fr. = (30 — 10) 20, 12 = 8, 3 = 2.

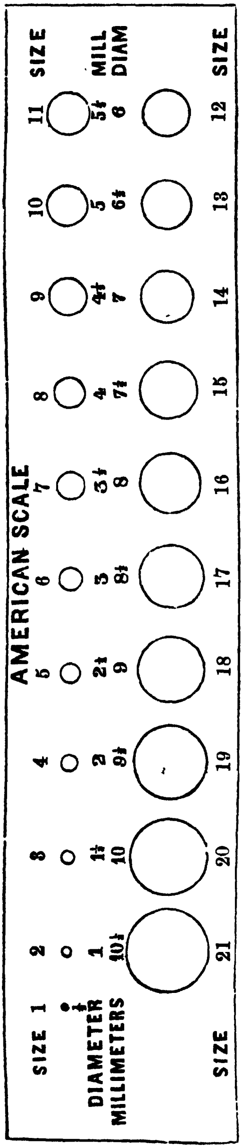
AMERICAN SCALE
SIZE 1 2 3 4 5 6 7 8 9 10 11 SIZE
DIAMETER MILLIMETERS ½ 1 1½ 2 2½ 3 3½ 4 4½ 5 5½ MILL DIAM
10½ 10 9½ 9 8½ 8 7½ 7 6½ 6
SIZE 21 20 19 18 17 16 15 14 13 12 SIZE

FIG. 88.—American Scale, Front.

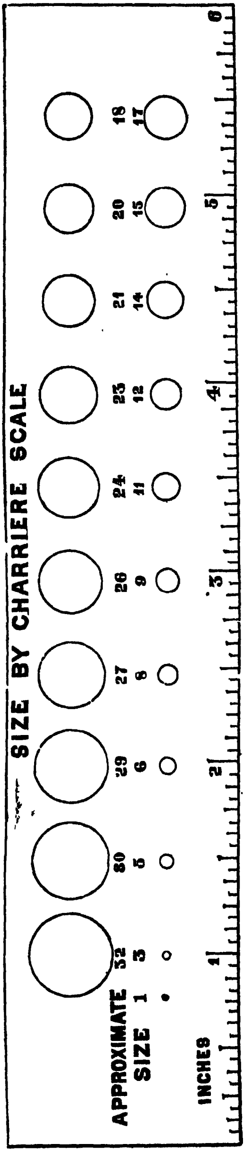
SIZE BY CHARRIERE SCALE
APPROXIMATE 32 30 29 27 26 24 23 21 20 18
SIZE 1 3 5 6 8 9 11 12 14 15 17
INCHES 1 2 3 4 5 6

FIG. 89.—American Scale, Back.

For computing the *exact* corresponding French size, add one-half of itself to any American size.

the surgeon has the advantage of using a wedge, as well as a lever, and, by carefully inserting any given conical steel instrument through a stricture, he practically does (with less violence) the same thing as if he passed 4 to 7 different blunt instruments (according as he uses a large or small sound), since the conicity of the sounds runs through four to seven or more sizes (p. 110).[1]

ADVANTAGES OF STEEL INSTRUMENTS FOR DILATING STRICTURE.—Since Thompson, one of the most brilliant minds connected with the subject of genito-urinary surgery, decided at one time in favor of the use of soft instruments for dilating stricture, a word will be necessary to state the reasons why the authors of this treatise hold a contrary opinion. In regard to facility of manipulation, that depends on practice, and he will use this, that, or the other instrument the best, who has used it the most. Less harm can be done with flexible than with solid instruments, undoubtedly, and on this account they are to be recommended for the unskilled, and for all, however expert, in the low sizes —below No. 9. In trained hands, however, the steel sound is perfectly safe; it is smoother than any soft instrument, and certainly can be passed into the urethra with less pain than can any other instrument, and is capable of effecting more dilatation, in the same length of time, with the employment of less force.[2] Steel instruments, made with the curve and conicity already described, possess all the powers of the wedge, and of a lever of the first order. The surgeon holds the long arm, the fulcrum is a sliding one, situated at the junction of the shaft with the curve, perhaps steadied by the surgeon's finger. The immense power which the application of this compound mechanical principle, in the construction of the instrument, gives to it, is not appreciated by surgeons. The ease with which harm may be done, in using force with conical sounds, is rarely realized until after an accident has occurred, and then the surgeon is liable to ascribe the mischief to chance rather than to his own carelessness. Swelled testicle, congestion of the neck of the bladder, irritation of the stricture, even false passage, may be produced by a surgeon in too great a hurry, or using force. It is a rule, from which no departure should be made, either on account of solicitation by the patient, or desire to push the case to a rapid termination, never to use force with any instrument in the urethra—especially with conical steel sounds. The character of the stricture may, occasionally, in the judgment of the operator, sometimes require force, but the motive for its use must never be haste, or desire to effect a rapid cure. The weight of the instrument, aided by a little coaxing, will usually exert all the power necessary. "*Festina lente*," is the golden rule. Patience and gentleness will effect more than force in the long-run.

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[1] Following a practical feature adapted to scale-plates by Dr. E. A. Banks, of New York, the plate is made six inches long, and marked in inches. Markings in millimetres and centimetres might be added.

[2] Patients tested, at the same sitting, with soft and steel instruments, almost invariably complain less of the latter.

INSTRUMENTS FOR DIVULSION.

DIVULSION signifies forcible rupture. There are three instruments well suited for the treatment of stricture by this method. Thompson's instrument for "rapid dilatation," as he terms it, consists of two parallel blades, slightly curved toward the beak, at which they are joined. The blades may be separated laterally, to the desired extent, by turning the handle. When the blades lie in contact, the instrument resembles a slightly conical metallic sound, size 8, a little curved toward the beak, which terminates in a slight bulbous expansion. By turning the handle, the blades may be separated to an extent corresponding to size 17, or larger. The degree of separation is indicated by a register in the handle. The instrument is marked by lines one inch apart, commencing from the point of greatest dilatability. These lines are to indicate the depth of this point from the meatus, after the instrument has been introduced. A small metallic slide, on the outside of the shaft, is so arranged as to slip up and down when the instrument is closed.

In using this instrument, the depth of the stricture to be acted upon is first accurately determined with the bulbous bougie. The metallic slide is then pushed down upon the closed instrument, until its distance from the point of greatest dilatability equals the distance from the meatus to the centre of the stricture. The instrument is now passed into the urethra until the meatus is touched by the slide, whereupon the latter is slipped up to the handle, and the operator is confident the point of greatest dilatability of the instrument corresponds to the centre of the stricture. No anæsthetic is required. The patient is lying upon his back, Thompson's idea of the proper use of this instrument (as expressed by his naming it a "rapid dilatator") was, that it should stretch as much as possible without tearing. To obtain the greatest usefulness from the instrument, however, this idea must be abandoned;[1] on the contrary, it should be used with the avowed object of rupturing (divulsing) the stricture. In this way only can its full and best effect be obtained, and, so employed, it is the best instrument we possess for performing divulsion. It accomplishes all that Reybard claimed for deep internal section, in his celebrated monograph,[2] which obtained the Argenteuil prize from the French Academy in 1852, and it does this without the dangers to which these deep internal sections were liable—hæmorrhage infiltration, abscess. It splits the stricture, and allows a splice to be put into it by the healing process. The dense, hard tissue constituting stricture gives way under the application of sufficient force before the soft, naturally elastic parts around it; and the fact, that a torn wound bleeds less than an incised wound of the same part, at once establishes the advisability of preferring divulsion to incision, and that all the more strongly for strictures situated low down in the urethra, where it is difficult to arrest severe bleeding, should it come on.

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[1] Thompson has recently given up the use of the instrument.—BUMSTEAD (oral com.).

[2] "Traité pratique des Rétrécissements du Canal de l'Urètre," Paris, 1843.

Thompson's instrument has been very advantageously modified by American ingenuity. The modifications consist in making it smaller in its shaft and tunneling its beak (Fig. 40), so that it may be introduced through a tight stricture with safety, over a whalebone guide (p. 104). It is also made to terminate in a little screw, so as to be adaptable to a soft filiform guide passed through the stricture. In the latter case the instrument is provided with a slightly bulbous tip, which may be screwed upon its beak, instead of the filiform bougie, bringing it back to its original simplicity, where it may be used without a guide, if desired. The American instrument, furthermore, is made to expand to a greater extent than Thompson's, fully up to size 20 (or larger, if desired)—a degree of distention which it is often desirable to bring to bear upon a tight stricture in a naturally large urethra.

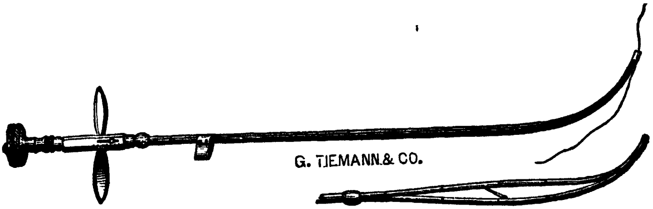

FIG. 40.

After the instrument, with or without a guide, has been introduced to a proper depth, the operative procedure is as follows: The handle is turned rapidly until the blades have been separated to an extent several sizes larger than the patient's meatus will admit. The failure of the operation, if it is unsuccessful, usually depends upon the employment of too little force. It is better to tear too much than too little. If any thing gives way it will be the stricture, and not the healthy urethra, and this is the object which the operator has in view. The patient may prefer to screw up the instrument himself, taking perhaps half an hour to perform the operation.[1] The pain, which may be at first quite severe, becomes as a rule sensibly modified as soon as the stricture begins to rupture and blood shows itself at the meatus. The stricture may be nearly always felt, sometimes almost heard to tear. After blood begins to flow, further separation of the blades rarely increases the pain to any extent. It is always a pleasant thing to see blood, as this indicates that the operation is being successful. Some strictures are so elastic (resilient), that, although the instrument is screwed up to its highest dimensions, they still refuse to rupture; no blood flows, or there is only a slight staining; and, after the divulsor is withdrawn, instead of a

[1] As actually happened in one of the authors' cases.

No. 20 passing with comparative ease, as the surgeon and patient had expected, both are surprised to find that, perhaps, only a 7 or 8 will go, and that with difficulty and pain.

CASE XV.—A striking case, illustrating this point, occurred January, 1872, at the Charity Hospital. The patient had an old stricture about four inches down the canal, which admitted 7 with difficulty. Thompson's divulsor was passed without a guide, and screwed up to 20—its fullest extent. After withdrawal of the divulsor it was found that 18 would not pass; 12 and 9 also failed, consequently the divulsor was reintroduced, accurately adjusted, and again screwed up to its fullest extent. Again No. 9 steel was tried, then 7; finally, No. 3 soft French conical bougie, which entered the stricture, but was arrested and would not pass on. On attempting to withdraw this bougie, it was "grasped" powerfully by the stricture.

Here was an instrument smaller than the shaft of the divulsor used, but yet grasped more tightly than was the divulsor itself when first introduced. Six hours after divulsion the patient had partial retention. On the following day every thing returned to the same condition as before the operation. No trouble followed the attempt at divulsion. The condition of the stricture was absolutely unaffected.

Such cases must be subjected to the use of a divulsor which separates sufficiently to rupture them, or must be cut. They are rarely amenable to ordinary dilatation afterward, if the divulsion fail. Traumatic strictures and those caused by nitrate of silver are sometimes, but not invariably, of this variety.

A caution is necessary in withdrawing the divulsor. As the instrument is being unscrewed, so as to bring the blades together, after they have done their work, it is proper to push the whole instrument on still farther into the bladder—which should always contain about three ounces of urine, if possible. In this way the accident, during withdrawal, of catching a fold of mucous membrane in the closing blades at their point of junction, may be avoided, an accident very liable to happen if this precaution is neglected. If the instrument is properly made, this is less apt to occur; the blades, where they come together at the angle of junction, should be decidedly rounded off, not coming flatly together. If a small flap of mucous membrane should be caught, it can never be detected until traction shows the instrument to be retained. It is now too late to attempt to dislodge the fold which has been pinched into the angle of the blades. It cannot be done. The little piece of membrane must be torn off. This tearing is hardly noticed by the patient, as the mucous membrane is not sensitive. The accident seems to have no effect in producing urethral fever, nor does it seem to influence in any way the success of the operation; but it is decidedly more agreeable to the surgeon that it should not happen.

Hæmorrhage, after the operation, is trifling. The callous tissues do not tend to bleed much when they have been torn. A full-sized conical steel sound, as large as the meatus will admit (the latter may be incised, if unnaturally small or strictured), should be introduced at once into the bladder, for the sake of testing whether or not the stricture has been thoroughly divulsed. Sometimes the stricture is so torn that an angle or pocket is formed at the previously strictured point in the floor of the urethra, in which the point of the sound engages. A knowledge of this fact suggests the means of overcoming it—by keeping the point of the sound well up against the roof of the urethra. If the stricture has been thoroughly ruptured, though it may be still felt by the sound, yet, upon the withdrawal of the latter, there will be no "biting." It requires more force than is usually supposed, to rupture a stricture thoroughly. After the operation it is expedient to keep the patient in bed for from twenty-four to forty-eight hours, and this especially if the urine is highly alkaline or decomposed, or the bladder very sensitive and irritable. In the latter condition it is always prudent to administer, before or immediately after the operation, ten grains of quinine with a quarter of a grain of morphine, to keep off, if possible, or moderate, the chill and urethral fever which may ensue. Contact of urine with the cut surface cannot be avoided; a little urine usually flows away as the instrument is being screwed up.

Accidents may, of course, happen with this operation, but they are rare. Especially if the urine is healthy, the patient may pass water at once over the wound, and go about his business without feeling any appreciable discomfort. It is prudent, however, to retain him in bed for a while, if possible, as severe urethral fever sometimes follows the operation, and abscess and infiltration are not beyond the range of possibility. Epididymitis may also come on. It is not very uncommon for a certain amount of blood to escape during the operation, under the skin around the urethra; this frightens the patient, but is of no importance: if let alone, it will be reabsorbed in a few days. No after-dressing is required, if the patient remains in bed. If he goes about, a little collodion over the meatus will be sufficient to keep his clothes from getting soiled by blood. The treatment after divulsion consists in the introduction of a full-sized conical steel sound on the seventh day after the operation (unless urethral fever should occur, and run particularly high), and, finally, in the continued use of the sound, as after cure by dilatation.

The operation of divulsion, blind and rough and brutal as it appears at first sight, has proved itself exceedingly mild in its immediate, and satisfactory in its ultimate results. In cases where the bladder and urethra are very irritable, it seems sometimes as if less urethral fever followed divulsion than the simple use of an ordinary small dilating instrument (Case XI., p. 49); true, there may be a good deal of constitutional disturbance, as indeed after any operation in the urethra, but this is exceptional where the urine is not too alkaline, and where the kidneys are not diseased. Death may follow divulsion in exceptional cases, as it may the use of any instrument in the urethra.

CASE XVI.—In January, 1872, a robust, middle-aged man, with an old tight stricture at the bulbo-membranous junction, some hypertrophy of the bladder, and mild chronic cystitis, appeared at the Charity Hospital. The patient was a vagabond, had been a hard drinker, and, some time before, in the workhouse, had had a light attack of what was considered delirium tremens. Divulsion was performed upon this patient. He had a chill during and at the close of the operation, before the instrument could be removed from the urethra. A little morphine was thrown into his arm, and gr. x quinine given. He went on rapidly into a low state of fever, with mild, rambling delirium (resembling mild delirium tremens somewhat), and died on the ninth day. He had no chills, except the slight one at the moment of operation. The *post mortem* proved that pyæmia was the cause of death. The stricture was found ruptured longitudinally along the floor of the urethra. There was a small, diffuse, half-formed abscess in the scrotum, communicating with the urethra through the incision. This had appeared on the fourth day after the operation, and grown very slowly. Several abscesses were found in the prostate, and another, of the size of a nut, in the left lung (none in the liver, spleen, or kidneys). There was slight pleuritic effusion on both sides, and a good deal of fluid, and recent plastic lymph in the pericardial sac. On both arms, around the points of puncture made for subcutaneous injection of morphine, there was a patch of diffuse subcutaneous suppuration.

This patient was evidently ripe for suppuration at any point injured.

When Thompson's divulsor is used upon a guide, it is a very safe instrument in treating even the tightest strictures. It is preferable to the instruments of Holt or Voillemier, both because there is in the operation no sudden shock of driving home a shaft, and because all the force is brought to bear upon the spot which it is desired to rupture, while the rest of the urethra is spared; furthermore, the amount of separation of the blades may be regulated at will, and the surgeon may cease turning the handle as soon as he feels assured that the stricture has been sufficiently ruptured.

HOLT'S DIVULSOR.

This instrument is preferred by many for the rupture of stricture. A few words will suffice to describe it. It consists essentially of two parallel blades, inclosing a hollow central shaft, through which a drop of urine escapes when the beak of the instrument enters the bladder. When closed, the instrument resembles a slightly conical, curved sound, of small size, with a broad handle for convenience of manipulation. Conical, hollow metallic tubes of different sizes accompany the instrument.

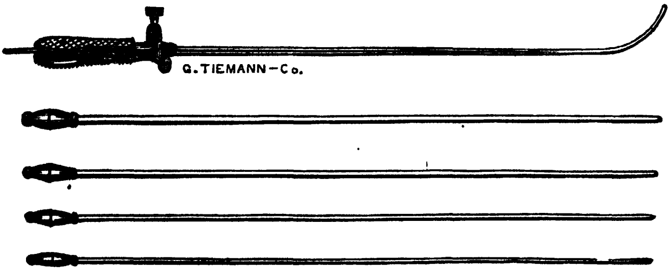

FIG. 41.

After the beak has entered the bladder, a tube of suitable size is selected, and fitted over the central conducting shaft between the two blades. This tube is driven forcibly home by a single stroke, the penis and handle of the instrument being held immovably by the surgeon's disengaged hand. The two parallel blades are forcibly separated by the passage of the large conical shaft between them, and the stricture, unless too resilient, is ruptured. The operation is not very painful, and no anæsthetic is required. Holt performs it with the patient standing up against a wall, supported on either side by an assistant. The whole instrument is withdrawn together, being partially rotated from side to side, to disentangle any shreds of mucous membrane which might be caught. The results and necessity for subsequent use of the sound are the same as after all other operations.

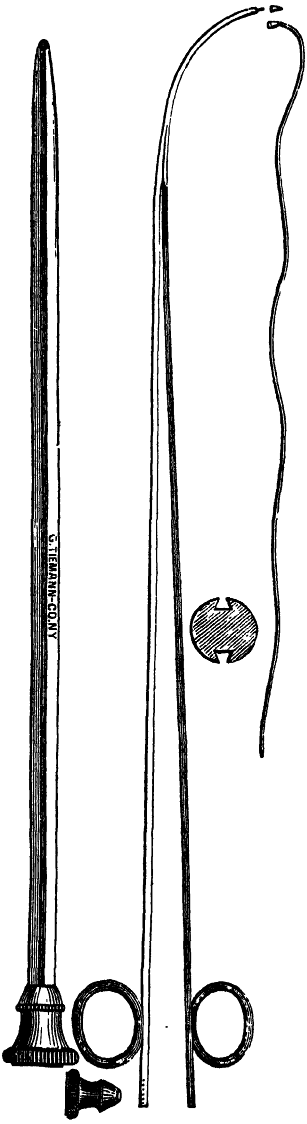

FIG. 42.

Holt's instrument may be tipped with a screw, for the adaptation of a soft filiform bougie guide, in case the stricture is tight. An adjustable metallic tip covers the screw when no guide is to be used. Bumstead has enlarged its sphere of action, by having the dilating tubes made much larger than those of the original instrument. Where many strictures are to be dealt with at once, Holt's instrument may be useful, but for general application it is much inferior to the American modification of Thompson's instrument.

VOILLEMIER'S DIVULSOR.

This instrument is essentially the same as Holt's, but is more simple, and therefore better. It consists of two thin parallel blades joined in a curved, slightly conical beak (Fig. 42). These blades fit into grooves on either side of conical, cylindrical, solid shafts of different sizes up to 20. It may be used with a whalebone guide, or screw-tipped, with a soft bougie.

The blades are introduced closed; a shaft of suitable size is well oiled, and into its external grooves are fitted the thin parallel blades, which, filling the grooves, make the instrument cylindrical. The shaft is driven forcibly home, as in the manœuvre with Holt's instrument. The blades of Voillemier's instrument separate laterally, those of Holt's vertically. Subsequent use of sounds is necessary for permanent cure.

INSTRUMENTS FOR INTERNAL URETHROTOMY.

Four instruments only need be described, suitable for the treatment of strictures in different portions of the canal.

THE CONCEALED BISTOURY.—Civiale's "bistouri-caché" (Fig. 43) serves to enlarge the meatus, or to cut strictures within about the first inch of the canal from the meatus. It consists of a small concealed blade, which may be disclosed by pressing upon the handle, after the instrument is introduced. A screw arrangement in the handle regulates the extent to which the blade may be made to cut.

This instrument is introduced closed, the blade is protruded to the desired extent, and the instrument is suddenly withdrawn, cutting its way out. If other strictures are to be forcibly dealt with at the same sitting as that in which the orifice is to be enlarged or a stricture near by cut, the deeper strictures should, if possible, be attended to first, to avoid the confusion which the bleeding from the cut orifice might occasion.

A full-sized steel conical sound is introduced at once to control hæmorrhage, which is usually trifling in amount, but sometimes considerable. On withdrawing the sound after a few moments, if there is only a slight oozing of blood, the cut is best dressed by the insertion into the meatus of a shred of lint or cotton-wool to prevent union. If the bleeding be considerable, a shred of lint is introduced into the cut, and the meatus is plentifully painted over with collodion. The meatus must be pressed laterally, while the collodion is being applied; otherwise a little blood will ooze up, and the collodion will not adhere. With this dressing, hæmorrhage and oozing become impossible. With no other dressing is the patient's linen safe from the possibility of being soiled. At the next urination the dressing is removed, and it is rarely that any considerable hæmorrhage follows. A full-sized conical steel sound is to be introduced into the meatus daily for a few days, and then at longer intervals, to prevent too much contraction during cicatrization; or, more simply, the patient may keep the cut open with a hair-pin, visiting his surgeon twice during the week.

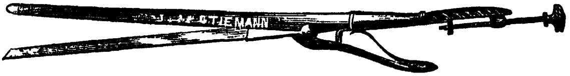

FIG. 43.

CIVIALE'S URETHROTOME.

This instrument consists of a straight, small shaft, terminated by a flattened bulb, which conceals a small semicircular blade (Fig. 44). By means of a mechanism at the handle this blade may be protruded to a greater or less extent, as desired, a register in the handle indicating the degree of protrusion. The bulb is to be passed through the stricture, and then pulled forward until it meets resistance. The blade is now protruded and the whole instrument drawn out, until the stricture has been divided, when the blade is sheathed and the instrument withdrawn. This is the safest urethrotome which can be employed. It is applicable to strictures within four inches from the meatus, but, before it can be used, the stricture must be large enough to admit the bulb. If it is desired to use it upon a very tight stricture, the contraction must be first stretched somewhat by Thompson's divulsor upon a guide. No urethrotome cutting from before backward is safe without a guide. Hæmorrhage after internal urethrotomy is, as a rule, greater than after divulsion. If it becomes alarming, it may be arrested, after collodion over the orifice has failed, by injections of persulphate of iron; or, as a last resource, by perineal section, with plugging of both ends of the urethra. Otis and Banks, of New York, have each recently produced modifications of Civiale's urethrotome, the main difference in each case being that there are bulbs of many sizes which may be screwed upon the same shaft; the instruments may be used with conductors. The principle of action and method of cutting are the same. The after-treatment of internal urethrotomy is the use of the steel sound, as after all other methods of cure.

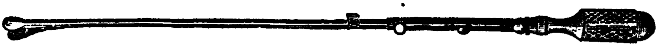

FIG. 44.

MAISONNEUVE'S URETHROTOME.

This instrument is serviceable where it becomes necessary to incise stricture situated deeper in the urethra than four inches. It consists of a hollow wire with a linear opening on that side which corresponds to the roof of the urethra. The knife, of different sizes, cutting from before backward, and from behind forward, with its exposed obtuse angle always blunted, is attached to the end of a long stylet which fits into the groove of the instrument. The blade is prevented from slipping out by a projecting shoulder on either side, which runs inside the hollow wire. Bumstead has advantageously modified the original instrument by making the knife run only to the beginning of the curve, instead of up to the point, and by making the tube a little more solid.

The instruments, as now made, have the blade on the lower side (Fig. 45). This urethrotome is to be used with a screw-tipped filiform bougie.

It is introduced, following its guide, and depressed until the straight portion of the tube has passed the stricture. Then the blade is entered, pushed rapidly down, as far as it will go, and immediately retracted, the instrument being twisted a little, if desired, so as to nick the stricture again during withdrawal.

The objection to this instrument is, that if a large blade is used the healthy urethra is incised longitudinally, often for its whole length anteriorly to the stricture; an accident perhaps of no very great moment, but entirely unnecessary, while, if a small blade is used, the whole thickness of the stricture is not cut through. Voillemier has attempted to overcome this objection by adapting a shield to the blade from which the latter may be protruded when the stricture has been reached, but the modification is complicated and unsatisfactory (Fig. 46). Another objection applicable to all instruments for incising the deep urethra is, the liability to hæmorrhage, if the incision is sufficiently deep to be effective. Such hæmorrhage at the bulbous portion of the canal may be very difficult to control. The after-treatment is the same as after all other operations.

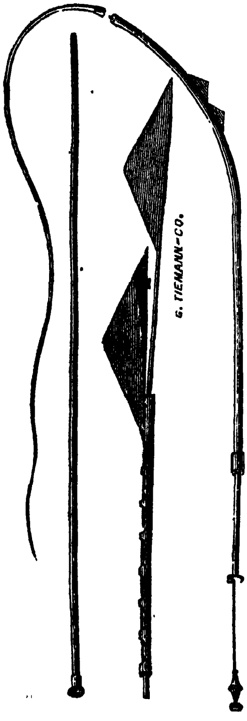

FIG. 46.

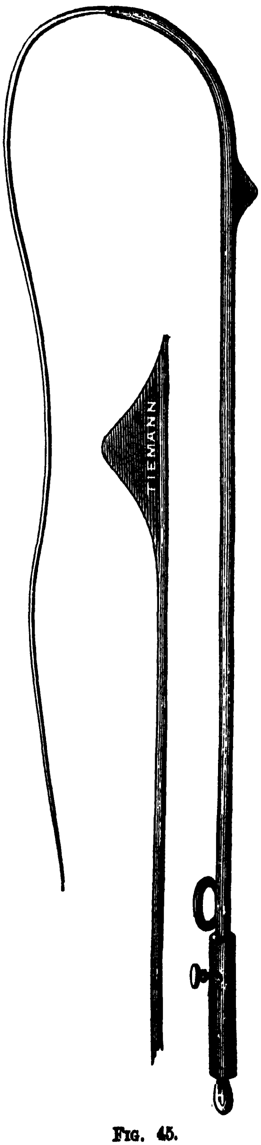

FIG. 45.

DILATING URETHROTOMES.

Several instruments have been recently devised to cut strictures of large calibre, such, for instance, as have been dilated but are somewhat resilient, and cannot be further effaced by dilating instruments, or, indeed, to cut any stricture after first having put it upon the stretch, an idea first successfully carried out by Reybard. Perhaps the most useful of these is Otis's urethrotome for strictures of large calibre (Fig. 47). The instrument is of large size (No. 10), consists of a straight round staff, from near the end of which a parallel bar may be separated by a screw in the handle. Along the top of the instrument runs a groove concealing a fine blade, which, at a certain part of the groove, runs over a concealed ridge (after the manner of Ricord's coarctotome), and then again sinks into the groove, by being drawn forward, and, cutting for about one and a half inch, disappears. The distance of this little ridge in the groove from the handle is marked in inches upon the shaft of the instrument. A register in the handle indicates the extent of separation of the two parallel blades. A soft large guide screws on the end of the instrument, so that it may be used, if desired, in the deep urethra. The instrument is also tunneled.

In using this instrument, the exact position of the stricture is first ascertained with the bulbous sound. The instrument is now introduced so that the ridge in the groove shall lie exactly at the strictured point. The two blades are separated until the stricture is put well upon the stretch; and, finally, the concealed knife is pulled forward over the little ridge, cutting its way through the stricture in its course, and then again sinking down out of sight.

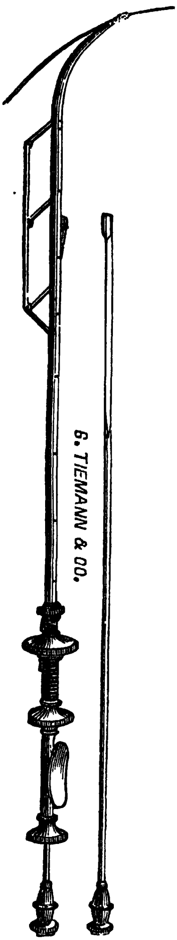

FIG. 47.

INSTRUMENTS FOR EXTERNAL PERINEAL URETHROTOMY.

Besides some of the special instruments already described, only two others are requisite in order to meet the requirements of any case (and there are few of them) calling for external section.

1. A simple staff, broadly grooved on its convexity, the groove running off at the end, and the instrument not conical (Fig. 48). This instrument is introduced as far as the stricture, when the latter is impervious, and is cut upon in the operation of perineal urethrotomy without a guide.

It may be used with a guide, the latter being a whalebone bougie, introduced through the stricture (Fig. 49). In this case it is practically the same instrument as the staff of Syme[1] (*see* note, page 127), the eminent surgeon who gave this operation its reputation. Syme's staff is unsafe compared with the means now at our command, and is rarely used.

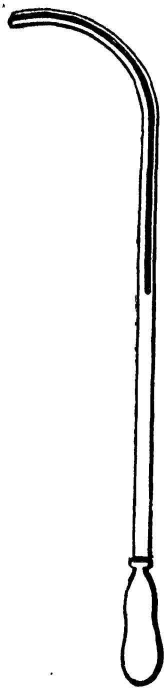
FIG. 48.

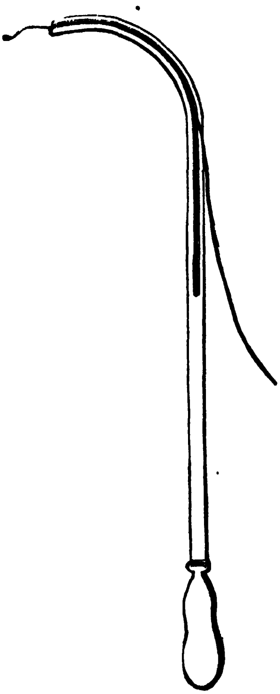
FIG. 49.

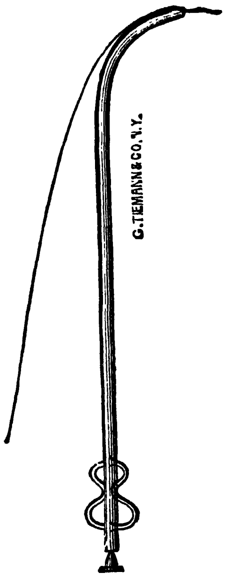

FIG. 50.

2. The catheter-staff of Gouley (Fig. 50). This most excellent instrument is a metallic catheter (they are made of various sizes), grooved on its convexity, the groove being bridged over at its end, forming a loop to receive its guide—a filiform whalebone bougie.

Scalpels, probes, and a long, slender, probe-pointed director, are required for the operation.

EXTERNAL PERINEAL URETHROTOMY, WITHOUT A GUIDE.

Few operations in surgery are more formidable than this one of external perineal urethrotomy, *without a guide.* The surgeon who approaches it should be thoroughly at home in the anatomy of the perinæum, and even then should be prepared for possible failure. The patient is tied or held in the lithotomy position, after he has been anæsthetized. The scrotum is held up out of the way by the assistant who manages the grooved staff. Ether relaxes spasm, and a last attempt to pass a filiform bougie, after the patient has become unconscious, may be successful, where previous efforts have failed. Should the attempt succeed, the operation at once becomes simple and easy. Failing, the operation without a guide must be undertaken. The perinæum having been shaved, an external incision should be made directly in the median line, from two and a half to three inches long. It should be carried down, layer after layer, until the urethra has been opened into upon the end of the blunt staff previously introduced up to the front face of the stricture. The perinæum should be turned toward a window, and a couple of hours of daylight always allowed, in order to have an abundance of time, if the operation proves complicated. Haste, in this operation, is bad surgery. After the urethra has been laid open, the subsequent steps of the operation are greatly simplified by adopting Avery's suggestion for getting room and light. It consists in transfixing each flap of the wound with a stout ligature about three feet long. The ends of each ligature are now knotted, thus forming a long loop on either side, which may be held by assistants. By means of these loops the wound is kept open to the bottom without the necessity of thrusting fingers or spatulæ into the small space, where the fingers of the operator alone are necessary.

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[1] "Stricture of the Urethra," Edinburgh, 1849.

With the urethra opened in front of the stricture, the surgeon carefully searches for the anterior opening of the latter with a fine probe, or, better, a fine probe-pointed director. If the opening can be found, and the director passed through it, the rest of the operation is simplified at once: but this fortunate result is rare. Having failed to find the orifice of the stricture, after a patient search, the surgeon feels for the hole in the triangular ligament, below the depression lying above the sub-pubic ligament, and cuts into it through the fibrous mass by successive strokes of the scalpel, always in the median line. At short intervals during the operation, the surgeon gently endeavors to coax his fine director, properly curved, through any opening he may think he sees, into the dilated urethra beyond. After each failure he resumes the cutting in the median line, guiding his knife by frequently taking the bearings of the tubera ischii, and with his finger in the rectum. In this way he continues, feeling his way as he goes, until finally his director finds some orifice through which it passes onward into the bladder. When this has been effected, a probe is passed in the groove of the director, also into the bladder; and now, by separating the two, a gush of urine is seen to mingle with the blood, announcing that the bladder has been reached.

The director, once in the bladder, should not be removed until after the opening has been increased, and a large instrument (nothing is better than the little finger), can pass into the bladder. A mistake often made in searching for the opening into the urethra with a probe is in trying too high up, too near the sub-pubic ligament.

Having now opened a way into the bladder, all fibrous bands in the *roof of the urethra* [1] must be cut with the knife, and any fibrous material detected in the floor of the canal, at either extremity of the incision, should be freely divided. Finally, a blunt steel sound, as large as the urethra will admit, should be passed through the meatus into the bladder, the meatus being cut if necessary. This sound should be introduced several times, to make certain that it glides easily and without obstruction. If the stricture is an old one, it is always well to search the bladder for stone after the operation, and to remove any that may be found. Venous hæmorrhage may be abundant, but it is easily restrained by plugging the wound with lint or tow, and tying the legs together after the operation. The scrotum should be bandaged up out of the way, to prevent the possible infiltration of its loose tissue by blood or urine. The thighs should be elevated, and a cradle used to keep off the weight of the bed-clothes.

This operation may be greatly simplified by puncturing the dilated urethra in the median line, if it should be found to be distended with urine behind the stricture, as is sometimes the case. Through such an opening, an instrument may be passed to the posterior face of the obstruction, and thus serve to guide the incisions from the grooved staff at the front face of the stricture through the callous mass. A perineal fistula may be utilized for the same purpose.

After external perineal urethrotomy no instrument should be tied into the bladder. Hitherto it has been common to tie in a catheter and leave it during the greater part of the cure, but experience has proved that this practice is dangerous, as being liable to give rise to ulceration at the various points where it makes pressure, both in the urethra and bladder, while it undoubtedly retards the healing of the perineal opening (*see* note, p. 127). Moreover, it is generally a serious additional cause of uneasiness to the patient, and is liable to leave the urethra indurated throughout its whole length, from the inflammation resulting due to its prolonged pressure. Furthermore, the urine, after a time, invariably passes through the urethra alongside of the catheter, thus defeating the object of its introduction, and finally, cystitis at the neck of the bladder is kept up and often permanently established by the pressure of the foreign body. It is very desirable that the first tendency of the perineal wound to heal should not be interrupted; the constant presence of a foreign body at the bottom of the wound inevitably modifies and delays the process of repair. The surgeon must satisfy himself, before the patient recovers from his anæsthesia, that he can introduce a full-sized sound easily into the bladder.

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[1] A neglect of this precaution sometimes renders the subsequent introduction of instruments very difficult.

The urine will pass at first through the perineal opening.

The after-treatment consists in the passage of a full-sized steel conical instrument into the bladder, commencing on the fourth day and repeating every three or four days until the wound has healed, thus forcing it, as it were, to heal with a large splice. After the wound has united, to prevent recontraction, the patient must pass dilating instruments at proper intervals, as after any other treatment designed to effect a radical cure of organic stricture. Infiltration and abscess may occur after the operation, and it is not very uncommon for fever to run high; but the results are usually excellent, unless the patient have organic kidney or other disease. Diluent, mucilaginous, alkaline cooling drinks, with quinine, tonics, supporting diet, and rest, complete the treatment.

EXTERNAL PERINEAL URETHROTOMY, WITH A GUIDE.[1]

This is an operation much simpler than the one just described. When external section of a stricture is contemplated, no effort should be spared and no amount of time grudged which is given to attempts at introducing a whalebone bougie. Even after the patient has been anæsthetized, the attempts should be renewed, for ether always relaxes urethral spasm, and, if, finally, a whalebone guide enters the bladder, the surgeon may congratulate himself and the patient's friends—for what would have been one of the most difficult operations of surgery (section without a guide) becomes at once one of the easiest.

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[1] Between the years 1847 and 1862, at first at the Bellevue Hospital, and afterward also at the New York Hospital, I devoted much time and labor to the study of old and neglected cases of stricture; numbers of which, some complicated with abscesses and fistulæ, others traumatic in character, were found among the patients in the almshouse, then connected with the Bellevue Hospital, and the sailors to whom the New York Hospital at that time afforded aid. At this period surgical operations for the relief of these aggravated and complicated cases of stricture were rarely resorted to except where life was threatened by retention, and catheterism impossible, when the operation known as "the perineal section" was undertaken—generally with the double object of relieving the retention and, at the same time, dividing the stricture longitudinally with the knife from the perinæum so as to afford this chance of permanent cure. But this operation was always undertaken with reluctance, being justly regarded as uncertain in its success, as to the possibility of reaching the bladder, as well as in its ultimate result. Being reserved for desperate cases of retention—often complicated with extravasation, in broken-down subjects, it was not unfrequently followed by death; and when this immediate result was happily escaped, the remoter results of the operation in a curative way were far from satisfactory. It was the uniform practice, after the operation was completed, to introduce a catheter of medium size (No. 9 or 10) through the urethra into the bladder, and to tie it in, replacing it every four or five days, or when it should become incrusted by calcareous salts, by a fresh instrument. The object of this practice avowedly was to afford a channel through which the urine might escape, other than the perineal wound, and to allow the perineal wound as it granulated to heal around the catheter, and thus form a new urethra. I soon found that neither of these results was in fact usually attained; the urine always escaped more or less freely beside the catheter and through the perineal wound; and the perineal wound rarely healed entirely while the catheter was worn—a fistula almost always persisting. I also satisfied myself, by observation, that the prolonged contact of the catheter was usually followed by inflammatory thickening of the urethral walls throughout the whole length of the canal; that in some instances it gave rise to excessive irritation, and in most cases to chronic inflammation of the bladder; and, in exceptional cases, that ulceration was liable to occur, both of the urethra and bladder at certain points, from prolonged pressure of the instrument—from which I have known more than one fatal result. I subsequently searched out and tabulated all the recorded cases of perineal section in the books of the New York Hospital from its foundation, and found that a majority of the patients left the institution with unclosed perineal fistulæ after wearing a catheter from one to six months, instances of their returning to the hospital within the year, to seek relief from relapsing urinary obstruction, being not unfrequent. Influenced by this experience, I took the responsibility of deviating from

A whalebone once in the bladder, the catheter-staff, or a tunneled steel staff, is passed over it up to the stricture. An incision through the perinæum in the median line readily exposes the end of the staff, and beyond it the black guide is seen disappearing among the tissues. Avery's threads make it easy to keep the guide in view, and a little

the usual practice, and left no catheter in the bladder after operating by the perineal section. The success which followed was highly satisfactory. The contact of the urine, which now escaped entirely through the perineal wound, was not found to retard the process of repair by its contact with the granulating surfaces. The introduction of a full-sized steel sound through the urethra into the bladder every day, or every other day, was found sufficient to antagonize any tendency to contraction on the part of the recently-divided stricture or strictures, and usually at the end of the sixth week I found the perineal wound closed. After teaching the patient to introduce a steel sound for himself, at proper intervals, I was then able to discharge him with little if any chronic cystitis, and, if true to his own interests, cured of his strictures as far as the disease in its advanced stages is susceptible of cure.

Sir Benjamin Brodie's *dictum*, that a perineal fistula will usually close spontaneously if the normal calibre of the urethra be preserved, was fully vindicated by the results thus obtained.

I had already given much attention to perfecting the shape and finish of steel sounds, and their adaptation to the normal curve of the urethra (*see* note 3 p. 30), and, by constant and laborious efforts with the instrument-makers, had finally succeeded in getting them to make the short-curved instruments now in use in this city. While thus engaged, the Jacksonian Prize Essay, on stricture of the urethra, of Mr. Henry Thompson, first reached New York, and his more formal and complete exposition of this subject confirming my efforts, I gladly accepted it as authority. The short-curved steel instruments, at first made blunt, I had subsequently finished with slightly-conical extremities. The old instruments which they replaced were made of heavy wire, bent into long, ridiculous, and constantly-varying curves, so awkward that they were rarely employed—bougies being generally preferred. These improved steel sounds I found of great service for introduction after perineal sections. Their adaptation to the natural curve of the urethra, and their conicity, made it easy to get sounds of the largest size into the bladder. To facilitate this, it was my habit to search out and remove, at the time of the operation, all strictured points in the urethra anterior to its perineal portions, dividing those at and near the meatus freely with the bistouri or meatotome, and those lying deeper by Civiale's urethrotome, so as to be able to pass the largest possible steel sound through the urethra into the bladder with entire ease, while the patient was still under the influence of the anæsthetic. With this precaution I rarely experienced difficulty in the subsequent introduction of the largest steel sound, without recourse to anæsthesia; and the patient, at the earliest possible moment, was made to introduce the instrument for himself, and taught that his future safety depended upon his honesty to himself in continuing this practice.

Syme, of Edinburgh, who, twenty years ago, was regarded as a very high authority, had declared himself emphatically in favor of dividing old and resilient strictures by the knife, from the perinæum, as a mode of cure preferable to dilatation, even where bougies could be readily introduced. He disputed with Reybard, of Paris, the claim of originating this mode of practice, the only apparent difference between them being that Reybard proposed to operate upon the stricture from within the urethra, whereas Syme advocated incision from without. The operation for the cure of stricture, which bears his name, is simply a modification of the old "perineal section," the stricture being divided from without upon a fine grooved director of steel, which had been previously insinuated through it to serve as a guide to the knife.

I found Syme's delicate grooved director, with its defective flaring curve, a dangerous instrument in hands less skilled than his, and, when filiform bougies were first obtained from Paris, I succeeded, by their aid, in getting through a good many old strictures which had hitherto been to me impassable, and such patients I induced to submit to perineal careful following up of this conductor soon lets the surgeon into the dilated urethra behind the stricture; the catheter-staff passes on into the bladder, urine flows through it, and the operation is satisfactorily accomplished. The only precaution worth mentioning is the necessary exercise of care not to cut off the whalebone guide in front of the staff by a careless stroke of the knife, as this might at once reduce the surgeon to the necessity of operating without a guide. After-treatment is the same as after the operation without a guide.

The result of external perineal urethrotomy is usually excellent; but death may occur due to shock, pyæmia, septicæmia, erysipelas, hospital-gangrene, infiltration, urethral fever with or without suppuration, etc.

section, *upon the filiform bougie as a guide.* I found the operation sufficiently easy and certain in its accomplishment, and the result, with the aid of the improved steel sounds, prompt and satisfactory. Rejecting Syme's instrument, but retaining the leading idea of his operation for stricture, I employed a full-sized blunt staff, with a groove on its convexity, running off at the middle of its blunt extremity, and large enough to lodge a filiform bougie (Fig. 48, p. 124). This I used instead of Syme's instrument, of which, indeed, it was a modification—his delicate grooved director, of steel, being replaced by a filiform bougie (Fig. 49, p. 124), the "shoulder" of his instrument being represented by the blunt end of my staff, which was placed as nearly as possible in contact with the stricture to be divided.

I was in the habit of teaching students the advantages, in the way of prompt and permanent cure, of this method of operating in bad cases of stricture, especially in hospital cases where patients could not always be induced to await the more slowly-obtained results of treatment by dilatation. To distinguish cases in which a bougie could be introduced as a guide from those of more serious character, which were impassable, I was in the habit of designating the operation in the former case as "perineal urethrotomy with a guide;" and I did all in my power to popularize the operation, believing it to offer better chances of cure than dilatation to a large class of cases.

Finding it not always easy to pass my grooved staff down to the perineal stricture, and, at the same time, to keep the filiform bougie (which had been already introduced through the stricture) from slipping out of its groove, I bridged over the groove of the staff for its last two inches, and, threading the tubular portion over the filiform bougie, passed it in this manner down to the stricture. The extreme flexibility and adhesive surface of the filiform bougie of that day interfering with the full success of this device, I diminished the extent of the bridged or tunneled portion of the staff, at first to an inch, and afterward to less than the third of an inch, for the purpose of diminishing friction. In dealing with cases requiring perineal section, I found a certain proportion of them were rendered so by the presence of false passages, which prevented the introduction of instruments for dilatation. On one occasion, after getting a filiform bougie into the bladder in one of these cases, the ease with which the "tunneled" staff could be glided over it suggested to me the advantage of this mode of dilating strictures where false passages interfered with the use of ordinary bougies, as well as of getting into the bladder, in cases of difficult catheterism.[1] I discussed this point with Dr. Gouley, who at that time was my assistant, and, at a later date (1865), having brought with me from Europe some improved filiform bougies finished with whalebone, I suggested to Dr. Gouley (who had frequently had instruments made for me by the cutlers) to have the beak of Thompson's dilator drilled or perforated, so that it could be threaded over one of these smoother and more rigid filiform bougies; so as, by this device, to get command of a stricture complicated with false passages. This he did (for me), and subsequently, following out the idea on his own account, he had, by the assistance of a mechanic, the principle brought to the perfection in which it is now found in the shops, adapted to all styles of urethral instruments—these so-called "tunneled" instruments being employed over filiform bougies.

I have introduced these facts of personal history because my agency in these matters has been ignored.—VAN BUREN.

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[1] The idea of using a guide in difficult catheterism was already old in surgery. Civiale ("Nouvelles Considérations sur les Rétentions d'Urine," 1823, p. 41) speaks of it as a valuable resource, and says that he found it in a work by Nauche ("Nouvelles Recherches sur les Rétentions d'Urine," third edition, 1806). The sliding tubes of Wakley acted on this principle; and the catheter open at both ends, passed into the bladder on a conductor over half a yard long, and having a whalebone in its centre, described by Phillips ("Traité des Maladies des Voies urinaires," Paris, 1860), affords another example.

Certain other operations on stricture must be mentioned to be condemned. Cutting out strictures is absurd, for the circular wound leaves traumatic stricture behind. Dupuytren's vital dilatation, which consists in tying in a large instrument pressed against the front of the stricture in the hope that it may pass after many hours, is unsurgical and has been superseded by better methods. Wakley's sliding tubes are clumsy, and Arnold's fluid pressure less good than any other pressure. Time has judged the internal use of caustics and condemned them, while the same fate awaits electrolysis, lately revived. It has been weighed in the balance, and found wanting.[1]

PUNCTURE OF THE BLADDER THROUGH THE RECTUM.

Only one instrument is necessary for this operation, a small, long (seven or eight inch), curved trocar with silver canula.

After the action of a full enema, the patient is placed in the lithotomy position (an anæsthetic is unnecessary), and the fore-finger of the left hand is introduced into the rectum. If the tip of the finger cannot distinctly make out the distended bladder beyond the prostate, and feel the impulse of pressure made over the hypogastrium, the operation should be abandoned. If the distended bladder is felt, an assistant presses down the hypogastrium, the trocar and canula are oiled, and gently carried into the rectum, guided by the finger of the left hand to the point of puncture. The puncture is made by a quick stroke, and should be exactly in the median line. The trocar is now withdrawn, and a portion or all of the urine drawn off, after which a cork is fitted and the tube tied in place with a **T**-bandage.

The contraindications of the operation are a large prostate, a small bladder, no fluctuation—and cases where there is no prospect of a speedy reëstablishment of the natural passage. The peritonæum is pulled out of the way by the distended bladder, and is in no danger of being wounded in ordinary cases. If the puncture is not in the median line, and a seminal vesicle be wounded, epididymitis may follow. A good deal of care is necessary to prevent the canula from slipping out. The operation is not a dangerous one. Out of forty cases reported by Cock,[2] there were seven deaths, but in none of these could the fatal issue be attributed to the operation. If an aspirator is at hand, its use should be preferred to rectal puncture.

PUNCTURE OF THE BLADDER ABOVE THE PUBIS.

This operation may be resorted to where the prospect of reëstablishment of the natural passage within twenty-four or forty-eight hours is not promising. No special instrument is required; a simple gum-elastic catheter will do, but a long (six inch), slightly-curved double silver tube (Fig. 51), modeled exactly like a modern tracheotomy-tube, into which a suitable trocar can be fitted, is most convenient. The inner tube should project beyond the outer, and be furnished with eyes near its point, which latter should be rounded, the size of the whole not being more than No. 10. The inner tube should be withdrawn and cleaned every forty-eight hours, the bladder washed out, and the external tube kept constantly in place.

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[1] "Practical Electrotherapeutics, Ten Cases of Organic Stricture treated by Electrolysis," Keyes, *New York Medical Journal*, December, 1871, p. 569.

[2] "Medico-Chir. Trans.," vol. xxxv., 1852, p. 153.

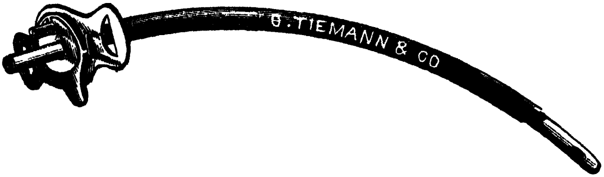

FIG. 51.

The operation is not a difficult one. The mons veneris is shaved, and an incision made down to and through the linea alba. Then, with the handle of a scalpel, the fat and connective tissue are separated until the fluctuating bladder can be felt. An assistant now makes gentle pressure upon the abdominal walls, while the surgeon, with his finger on the bladder close above the symphysis pubis, forces the tube above described, armed with a well-fitting trocar, quickly into its cavity. The tube is snugly tied in with tape, and the wound stitched around it. A piece of yellow English elastic catheter may be used instead of the tube, but it is kept in place with more difficulty. On account of the possibility of infiltration, the outer tube should not be removed until the walls of the new route have become consolidated throughout, which is accomplished in three or four days.

CASE XVII.—A patient was brought to the New York Hospital upon whom this operation had been performed some weeks before, but who had carelessly allowed his instrument to become displaced. Retention recurred, and the urine, finding an outlet through a breach in the walls of the new route, followed the extra-peritoneal layer of connective tissue through the external abdominal ring, and into the walls of an old hernial protrusion. This caused the latter to present such an equivocal appearance as to call for an exploratory operation in view of the possibility of strangulated or inflamed hernia. Through the incision, made for this purpose, the extravasated urine escaped so freely as to efface the swelling, and render the opening of the hernial sac unnecessary.

In case of any necessity to change the instrument before consolidation of the tissues has taken place around it, it is necessary first to pass a probe-pointed stylet through the tube, to the floor of the bladder; over this the tube is withdrawn, and the one destined to replace it is passed carefully upon the stylet to its place. With care there is very little danger of wounding the peritonæum in supra-pubic puncture, as its reflexion is drawn well up out of the way by the distended bladder. Puncture through the symphysis pubis, and below the pubes alongside of the root of the penis, has not yielded satisfactory results.

THE ASPIRATOR.

The aspirator is an instrument which has been recently brought prominently into notice by Dieulafoy,[1] of Paris. Several modifications are in the shops already, and a vast amount of experience, obtained since the instrument has been introduced into general use, has established its reputation as a safe and most useful assistant to the surgeon interested in surgical diseases of the genito-urinary system. The instrument is used for the exploratory and therapeutic tapping of cavities for fluids or gases. Ample experience has demonstrated that a fine exploring trocar and canula may be plunged with safety through both layers of peritonæum into the cavity of the intestine, into the bladder, into the cavities of joints, into the pleural sac, even through the pericardium, without lighting up any appreciable inflammatory trouble. Hence the value of this instrument in cases of retention becomes at once evident. It has been used day after day in such cases, the urine being drawn off safely, the canula withdrawn, and a new puncture made at each tapping. Within the space of eight days, twenty-three punctures were made in one case,[2] while, in another case,[3] eleven punctures were made within a circuit that could be covered by a ten-cent silver piece, without the least evil result. Consequently, where the surgeon possesses this instrument, it is to be preferred to all others for tapping the bladder. Where he does not possess it, rectal or the ordinary supra-pubic puncture may be resorted to.

The impunity with which the bladder may be tapped, even with a large instrument, may perhaps be best illustrated by a case reported by Dr. Clarke,[4] of Geneva, New York. The case was one of retention, from enlarged prostate, where catheterism proved impossible. Dr. Dox punctured the bladder above the pubes, without any previous incision of the skin, with an ordinary trocar, one line in diameter, and evacuated two quarts of urine, after which the canula was immediately withdrawn. This operation was repeated six times in eight days, without any precautions, and was followed by no ill effects. After the eighth day the patient reacquired (and at the date of the article still retained) the power of urinating by the urethra, as well as he had before his retention. Such an excellent result could not be counted on in most cases.[5]

Dieulafoy's smaller instrument is very portable, and is convenient for tapping the bladder; the box containing it measures eight and a half, by four and a half, by one and three-eighths inches. It consists, essentially, of a glass cylinder, with tight-fitting piston, and two stop-cocks, a flexible tube, and pointed hollow needle. Of the latter, there are several sizes, the finest two-thirds of a millimetre in diameter, twelve centimetres long, and fine enough to be used safely in all cases (Fig. 52).

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[1] "Traité de l'Aspiration des Liquides morbides," Paris, 1873.

[2] Guyon, Obs. II., Dieulafoy.

[3] Houzel, Obs. VIII., Dieulafoy.

[4] *Medical Record*, June 1, 1872.

[5] Maisonneuve was in the habit of puncturing bladders in this manner, with an ordinary fine trocar, at the Hôtel-Dieu, Paris, in 1866.—KEYES.

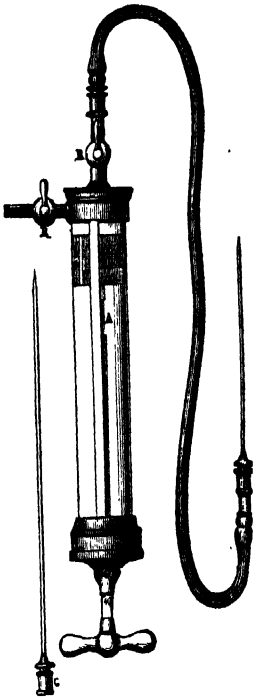

FIG. 52.

The method of using the instrument is the following: First, be satisfied that the fine needle is pervious—not occluded by rust or otherwise. Attach it beyond stop-cock *R*, or to the flexible tube, as shown in the figure. Shut both stop-cocks, *R* and *R'*; withdraw the piston forcibly, thus forming a vacuum. By a half-turn from left to right, hook the angle *A* above the point *B*, thus keeping the piston withdrawn. The instrument is now ready for use.

The point of election in puncture of a distended bladder is through the linea alba, about half an inch above the symphysis pubis. Into this spot the needle is plunged for half an inch. Now stop-cock *R* is turned on, and a vacuum is thus created within the flexible tube and needle. Next the needle is slowly and cautiously pushed forward until urine is seen to flow into the glass cylinder. It flows slowly on account of the size of the needle, but no pressure is required to help it. The needle is next pushed, perhaps, an inch farther into the bladder, and then there is nothing more to do until the glass cylinder is full, after which *R* is turned off, *R'* is turned on, *A* is unhooked, the piston is driven gently home, expelling the urine at *R'*. *R'* is now turned off, the cylinder again exhausted, *R* turned on, and so on, until the bladder is relieved, after which, the vacuum of the cylinder being maintained, the needle is rapidly withdrawn. The operation may be repeated as soon as the bladder refills.

CHAPTER VII.

STRICTURE OF THE URETHRA.

Diagnosis.—Use of Bulbous Bougie.—Symptoms of Stricture and its Results as affecting the Urethra, Bladder, Kidneys, Testicles, Rectum, Nerves, etc., including a Consideration of Infiltration, and the Harmlessness of Healthy Urine in contact with the Tissues.—Causes of Death from Stricture.—Recapitulation of Symptoms and Effects of Stricture.

Diagnosis.—Few morbid conditions of the body are more easy of diagnosis than organic stricture of the urethra. To examine for stricture, a bulbous bougie is selected of the largest size that the meatus will admit. It is oiled, introduced, and passed gently down the canal. If it goes on unobstructed into the bladder, there is no stricture; otherwise there is, for the meatus is the smallest part of the normal canal. When the instrument is arrested by an obstruction, it should be seized with the thumb-nail and fore-finger at the meatus and withdrawn. The distance between the bulbous point and that part of the shaft seized by the thumb-nail (measured on the side of the scale-plate) indicates the distance of the stricture from the meatus. Smaller bulbous bougies are now tried, until one is found which will just pass through the stricture. This indicates the calibre of the contraction. After the bougie has passed into the free canal beyond, it should be retracted until its shoulder is arrested by the stricture. Now the thumb-nail is again placed at the meatus upon the shaft of the instrument, and the whole withdrawn and measured. The difference between the two measurements will give the length of the stricture. Having localized and studied out one stricture, a bulbous bougie which will pass through it is employed, in the same manner, to search the canal beyond, it being a rule, with few exceptions, that where several strictures exist the calibre of any one is smaller than that of all the others between it and the meatus, and larger than that of all deeper-seated contractions.[1]

These bulbous bougies will detect tender places in the urethra, where no thickening exists, and will easily appreciate slight diffuse thickening of the urethral walls, not yet sufficiently defined to be pronounced stricture of any given length. Occasionally, in a sensitive, irritable urethra, the head of the bulbous bougie will be stopped by a muscular spasm of the canal, but this rarely except at congested, sensitive spots, or by contraction of the muscles surrounding the membranous urethra. Gentleness and a little delay will usually overcome this kind of obstruction, and, after the instrument has passed the constricted part, and an attempt is made to withdraw it, the spasmodic, muscular nature of the constriction can be easily appreciated. The muscles will be felt to "bite" the instrument, quiver a little, then suddenly let go and recontract. In cases of doubt, a blunt, full-sized, well-warmed and oiled steel sound should be passed down to the obstructed point and gently pressed against the obstacle to tire out the muscles, which, after a few minutes, will suddenly relax and the instrument will glide rapidly into the bladder, unless other obstacles exist.

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[1] If the bulb is arrested lower than six inches, it is suggestive of enlarged prostate, especially in patients beyond fifty-five.

Stricture of the meatus may be predicated whenever the orifice is seen to be involved in a cicatrix, or whenever a probe introduced within it can demonstrate a distinct pocket behind the superior or (more commonly) inferior commissure of the orifice (Fig. 53).

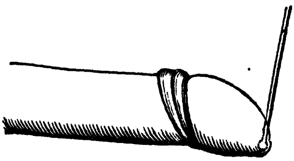

FIG. 53.

Care must be exercised not to confound lacunæ, which catch the points of small instruments, with stricture.

The endoscope and model bougies will not give any information which may not be obtained more easily by the means above detailed.

SYMPTOMS AND RESULTS OF STRICTURE.—Stricture may exist for years without giving rise to a single symptom of sufficient importance to attract the patient's attention. In fact, it may be said that stricture has necessarily no symptoms until it has become so tight as to sensibly obstruct the outflow of urine and semen, or has been attended by so much callous overgrowth as to interfere with the flow of blood through the meshes of the corpus spongiosum. A man may have stricture of small calibre of any part of the canal, but especially of the meatus, and yet never suffer from it in any way until adult life—perhaps never at all; but this is exceptional.

CASE XVIII.—A young married man, of twenty-four, a Jew, applied for relief of a very considerable degree of irritability of the bladder, which had been coming on for some time, the desire to urinate recurring as often as every hour. On examination, it was found that his meatus was involved in a smooth circular cicatrix. Being questioned as to the origin of this scar, the patient declared that he had always had it, and had considered that it was natural. He had never had any wound or ulcer upon his glans penis. It was subsequently ascertained that the wound had been made by the knife of the priest when the patient was circumcised upon the eighth day after birth, according to the Jewish rite. The stricture of the meatus caused by the healing of the wound had never given rise to any symptom until adult life, and then the only symptom was a frequent and urgent desire to urinate. The stricture was treated by incision, and the bladder-symptoms quickly subsided and remained cured.

CASE XIX.—A healthy married gentleman, of forty-two, applied for treatment of frequent urination. He passed water from fifteen to twenty times daily, but was not troubled at night. When watched, he could not urinate at all. The meatus admits No. 8, and has a pocket behind the lower commissure. This was slit, and No. 15 passed at once. After the operation the calls to urinate recurred but five times daily. The meatus healed in a few days, admitting No. 17 without stretching.

In this case the meatus was occluded by a thin duplicature of mucous membrane, which, when cut, scarcely bled. The patient has never suffered from this narrowing until now—his forty-second year. A lawsuit, full living, and excessive smoking, were the immediate exciting cause of the appearance of symptoms. Instant relief followed the re-establishment of the full size of the canal.

This case demonstrates the value of looking for the "pocket" at the lower commissure in obscure cases of bladder-disease, where there has been no antecedent local disorder.

The symptoms usually described as those of stricture are mainly the *symptoms of the results of stricture*, and consequently a description of these latter finds its place here.

A certain small amount of gleety discharge from the congested (or it may be granular) surface usually accompanies the forming stage of stricture, but this may be so slight as not to attract attention, or may be entirely absent. Exceptionally urethral or other neuralgia depends upon stricture in the forming stage (Case XIV.).

The results of stricture are mainly mechanical in the first place. The strictured portion is less dilatable than the rest of the canal, and acts somewhat like a dam. The urine coming down with great force, and striking against this unyielding bar, tends to dilate the urethra behind it (Fig. 54), and this directly in proportion as the stricture is slow in forming, and dense in structure. If more than one stricture exist, the urethra may be dilated between them. This stretching process tends to dilate the mouths of all the ducts opening into the urethra behind a stricture. In this way the sinuses and mouths of all the follicles become enlarged, and capable of entrapping the point of a fine instrument. This is also true of the ducts in the prostatic sinus, which may become so pouched out that the floor of the prostatic urethra becomes reticulated, and composed entirely of depressions, separated by thin fibrous partitions—these latter representing

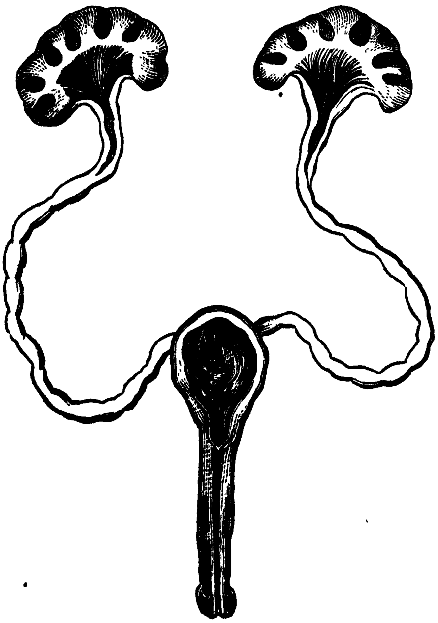

FIG. 54.—Taken from a pathological specimen, showing stricture of membranous urethra, with dilatation behind it, hypertrophy of bladder, dilatation of ureters, pelves of kidneys, etc.

what is left of the tissue which existed originally between the ducts of prostatic follicles. The ejaculatory ducts may be distended in the same way; as may also, though rarely, the seminal vesicles—the urine being forced back into them.

The force exerted laterally by the urine propelled through the urethra by the contracting bladder is much greater than is generally supposed. To understand this, it is only necessary to call to mind the hydrostatic paradox, which demonstrates the equal pressure of fluids on every square line of surface with which they come into contact. This forcible stretching of the mucous membrane behind the stricture at every act of micturition, although only slight in extent at first, weakens the tone of the stretched portion of the canal, congests it, and leads to the formation locally of an excess of mucus. If the urine be acid and irritating, these effects take place all the more rapidly. Soon a drop of urine is retained behind the stricture in the dilated portion of the canal, the mucus acting upon it as a ferment alkalinizes and decomposes it, liberating carbonate of ammonia. This acts upon the stretched urethra, and produces inflammation. This mild inflammation behind stricture is very constant. It furnishes the gleety discharge, or the morning drop of muco-pus, which glues the lips of the meatus together.

The gleet of stricture gets better or worse according to the general condition of the patient, the degree of acidity of the urine, and the amount of sexual indulgence or venereal excitement. Exacerbations of gleet from slight causes, or repeated attacks of gonorrhœa, as the patient usually considers them to be, often constitute the most marked feature of the case, in a patient with stricture. In fact, it is the rule in mild cases that the patient is wholly unconscious that his urethra is at all narrowed. He applies for treatment, on account of his gleet, for an attack of gonorrhœa, as he calls it (bastard gonorrhœa, p. 56), and often refuses to believe that he has stricture, or that, if stricture does exist, it is of enough importance to occasion his symptoms; and he repeatedly asserts that he makes as large a stream of urine as ever. Nothing so well as the bulbous bougie will convince such a patient of his condition. The evidence of this instrument he must admit. The gleety discharge, once commenced behind the stricture, rarely ceases entirely until the constriction has been relieved. The same discharge will be seen in the urine in the shape of small, stringy shreds, formed of pus-corpuscles which have been washed off from the congested surface behind the stricture, and rolled into threads on their way out of the canal. These shreds may be all caught in the first gush of urine, what follows being perfectly free from them. When these white filaments are seen settling down in a glass of urine freshly passed, they constitute strong presumptive evidence of the existence of stricture; they may be due to other lesions.

As the stricture tightens, fresh symptoms are added. A cartilaginous hardness may often be felt from the outside of the urethra at the constricted point. The meatus urinarius looks blue and congested, as does sometimes the whole glans penis, from obstructed circulation. The gleet continues, the stream of urine is small, often forked or curving up in a curious manner just after leaving the meatus, or there may be several streams running in different directions, or oftener one stream is projected for a certain distance, while the other drops down perpendicularly from the end of the penis. The last few drops of urine are retained in the canal, both mechanically by the obstruction of the stricture, and because the wave of blood, impelled by the contraction of the accelerator urinæ upon the bulb in the final effort at clearing the canal, cannot pass along the corpus spongiosum, on account of the obliteration of its meshes at the point of stricture, and thus fails in its function of expelling the last few drops of urine from the canal. By this same obliteration of spongy tissue, erection is sometimes rendered imperfect and painful.

The surface congestion of the stretched urethra behind the stricture in time extends backward to the bladder, and brings on irritability (so called) of that organ. The intervals between the acts of micturition grow shorter and shorter, and symptoms of mild cystitis appear. This *frequency of micturition* is the symptom of stricture, *next to gleety discharge*, which is least often absent. A slight narrowing of the canal may occasion it, as where the meatus is congenitally small, and it may come on with any stricture, as pure irritability, undoubtedly attended by congestion about the neck of the bladder, but not necessarily by any true cystitis.

The congestion of the urethra behind a stricture easily becomes greater, is kindled into positive inflammation by dining out, a little excess in drink, or a chilling of the legs; the mucous membrane swells up, the stricture closes, and the patient has retention of urine. If this retention is unrelieved, the bladder becomes overstretched; after many hours a few drops of urine will escape from the meatus (overflow), and the patient thinks he is getting better. If this condition of overdistention is allowed to continue unrelieved, the contractile power of the bladder may be permanently injured (atony). *Retention may be the only disagreeably prominent symptom* connected with a case of stricture. The gleet may not have been noticed, the gradual decrease in the size of the stream may have been ignored, when, after exposure, excess, a carouse of beer, retention suddenly comes on. Some patients will have had several attacks of retention before they apply for relief. The spasm and inflammation which caused the narrow canal to become obliterated in these cases cease after a few hours, and then the patient goes on perhaps for a year or more, without having another retention, not suffering noticeably in the mean time.

If retention does not come on, the inflammation, once aroused behind stricture, gradually, sometimes rapidly, travels back through the prostatic urethra into the bladder, and we have cystitis of the neck. Now commences what was before absent, or, if present, only to a mild degree, a frequent desire to pass water, at first every three or four hours, once at night, and gradually at shorter and shorter intervals, until, when the patient seeks relief, he may be passing water in a fine stream every half-hour or fifteen minutes, with great pain and straining.

Blood sometimes flows with the urine at the beginning or end of the act. *Hæmaturia* may be, exceptionally, the most prominent symptom of stricture, indeed the only one noticed by the patient for a long time, as in the following case:

CASE XX.—In December, 1871, ——, aged twenty-seven, came complaining of passing blood and having stricture. He had been married for six years, but his wife had not become pregnant. Twelve years previously had occurred his only gonorrhœa. It was attended by hæmaturia, and got well in a month. Slight gleety discharge soon reappeared, and has continued in greater or less amount ever since. In the autumn of 1869, while perfectly well and at work, he noticed that his urine was bloody. He had no pain at the time, and did not know that his stream was smaller than usual. From that time to date he has never passed water untinged with blood; often, to the unaided eye, it looks like pure red blood. He was treated medically, and finally for stricture, by the introduction of small instruments (up to No. 9), but all to no purpose. His stream became noticeably smaller; he was obliged to pass water every hour, several times a night, but the urine was not decomposed or ammoniacal, and contained no appreciable amount of pus. He felt weak from loss of blood, but had absolutely no pain. The amount of blood in the urine varied from time to time, but from no appreciable cause. He stated that he used to pass large clots as big as his thumb at about the middle of the stream. These evidently formed behind the stricture, but were not able to squeeze through it until "the middle of the stream," when the force of the current was greatest and the dilatation most positive. Sexual power was unimpaired, the orgasm perfect, but no semen issued at the time. It dribbled away afterward. A hard, callous stricture was found to exist at six inches, admitting a No. 5 bulbous bougie.

A filiform whalebone guide was introduced, over this Thompson's divulsor, and the stricture was stretched to No. 17; only a little blood followed; after a week No. 16 was passed quite easily. The patient's intervals of urinating were twice as long after the operation, and the amount of blood passed uniformly small. His meatus was cut, and finally No. 21 passed, but still the bleeding continued, the urine often looking like pure arterial blood, and the patient remaining blanched and unable to work, although passing a full stream at two or three hour intervals.

The treatment above detailed extended over the space of about a year. This patient was finally cured by the application several times of solid nitrate of silver to the urethra behind the stricture. He is now fat and comparatively well, introduces No. 18 himself, and usually passes clear urine. Sometimes, however, it is still slightly tinged with blood for a few days, when it again clears up.

Along with symptoms of vesical irritation, often before any actual inflammation of the bladder has occurred, are found pains various in character and situation. Pain in the urethra, aching of the glans penis, or in the testicle, along the cord running up into the back. Pains across the lumbar region, in the perinæum, around the anus, and in the rectum, over the pubis, etc., and other obscure pains of a neuralgic sort, in the thighs, legs, or in the sole of the foot[1] (Brodie), all of which pains are cured by the dilatation of the stricture. Urination is often painful (sometimes excessively so), the pain being at the neck of the bladder, in the perinæum, at the point of stricture, or near the glans penis. Erections may be painful, the venereal orgasm attended by pain, the semen not being discharged during the sexual act, but often dribbling away afterward, perhaps stained with blood, or running back into the bladder, to be discharged with the next flow of urine. Impotence sometimes accompanies this condition. The sexual appetite is often impaired, sometimes nearly obliterated, in old severe cases. But, in mild cases, the congestion kept up behind the stricture may be just enough to excite and irritate the patient, causing frequent erections, erotic fancies, nocturnal emissions.

The constant straining in urination keeps the hæmorrhoidal vessels congested. This results not unfrequently in an attack of piles, or of prolapse of the rectum; occasionally, hernia occurs from the same cause. The straining may be so violent that the bowel will protrude at every effort to empty the bladder, making it unsafe for the patient to attempt to urinate except upon a close-stool, for fear of the passage of fæces at the same time with the flow of urine.

The inflammation of the bladder caused by stricture is usually superficial, but it may become parenchymatous, perhaps accompanied by abscess in the walls of the bladder, or in the connective tissue around it. The bladder-walls, as a rule, thicken, while their dilatability diminishes, in cases of stricture (Fig. 54). The detrusor, constantly called upon to force the urine through a narrow orifice, becomes thickened and hypertrophied, sometimes to the extent of one-half or three-quarters of an inch.

Trabeculæ of muscular tissue project upon the mucous surface of the bladder, and between these trabeculæ the mucous membrane may protrude, forming pouches or sacculi. The bladder may contract to such an extent as to have its cavity almost totally obliterated, its muscular walls having undergone fibrous degeneration, which has rendered them non-distensible. In this condition (concentric hypertrophy) we may have a constant flow of urine from the urethra, which the patient cannot control (incontinence), to be carefully distinguished from atony, with overflow.

Instead of incontinence, in this condition, the patient may be obliged to empty his bladder every few minutes, after a few drachms of urine have accumulated, which seem to be bursting the organ. The urinary salts sometimes deposit in vesical sacculi, or a small renal calculus lodges there, forming a nucleus for stone. The more obstruction there is in the urethra, the more pressure is brought to bear upon the sacculi, and the larger they become, so that sometimes they equal, or exceed, the size of the cavity of the bladder. As the sacculus enlarges, its neck remains constant, and, if stone form in it, the stagnant urine (for there is no surrounding muscular tissue to empty it) furnishes constantly fresh supplies of urinary salts to increase the size of the stone, so that finally the latter may fill up the sacculus, constituting what is known as encysted calculus.

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[1] Or in the great-toe. The pain is sometimes compared to intense heat, sometimes to icy coldness, sometimes it is actual pain over a given small area.

Instead of contracting, the bladder may (rarely) dilate. In these cases there has not been so much irritability, and the bladder has not been called into such constant use; or overstretching may have been followed by atony, in which case overflow occurs, apt to be mistaken for incontinence. Inflammation of the mucous membrane is found, in these cases of eccentric hypertrophy also, together with the trabeculæ of hypertrophied muscular tissue and the sacculi.

These conditions of vesical and urethral irritation, or others, such as stone, are sometimes, but very rarely, attended by partial paralysis of some groups of muscles of the lower extremities, or indeed by paraplegia. These paralyses have received the name of reflex urinary paralysis, and seem to depend upon the morbid condition of the urinary organs, and to be relievable, sometimes even curable, by treatment of the urinary difficulty.[1] Not very infrequently mild syphilitic paraplegia is mistaken for urinary reflex paralysis, especially if the urethra or bladder happen to show any trifling lesion.

The urine, in cases of cystitis caused by stricture, is partly decomposed and filled with blood, pus, crystals, etc., as occurs in cystitis from other causes. Phosphatic stone may form. The ureters enlarge in connection with old stricture, sometimes to the size of the thumb. Their walls become unevenly thickened and their calibre enormously increased by the retained urine (Fig. 54). The pelves of the kidneys undergo the same distention, the tubuli and secreting portions being pushed out and compressed by the accumulating urine. After the inflammation at the neck has involved the whole internal surface of the bladder, it may extend up the ureters and enter the pelves of the kidneys, bringing on pyelitis, or attack the secreting portion as a subacute nephritis with more or less suppression of urine, attended by symptoms of uræmia. Finally, and more rarely, may be mentioned abscess of the kidney with perinephritis.

EXTRAVASATION.—The thinned and inflamed urethra behind stricture may ulcerate, and, during one of the violent paroxysms of straining, give way, and allow a little urine to escape into the cellular tissue around the canal. The patient is often conscious of something having "broken" in the urethra. The amount of extravasated liquid may be very small, or a sudden gush of urine is, perhaps, let out into the connective tissue.

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[1] Brown-Séquard, "Lecture on Reflexed Paraplegia," *Lancet*, 1863; and "Lectures on the Diagnosis and Treatment of the Principal Forms of Paralysis of the Lower Extremities," Philadelphia, 1861.

In the former case we have abscess, or perhaps blind internal fistula, which may continue as such for many months. Its presence is indicated by a hard lump around the urethra, varying from the size of a large pea to that of an English walnut, usually sensitive to pressure, sometimes slightly painful at each act of micturition. This hard lump more or less rapidly enlarges, though it may remain stationary for an indefinite period, or even decrease in size; urethral fever comes on, generally described by the patient as "dumb ague;" the appetite fails, and the general health runs down; finally, pus forms and finds its way out through the perinæum, leaving a fistula behind. Instead of this slow course, if the quantity of urine which escapes is a little larger, acute perineal abscess forms.

The pus may burrow in all directions, and finally find an exit through the scrotum, along the body of the penis, upon the thighs, nates, or groins, or even upon the lower part of the abdomen. Sometimes the whole perinæum is riddled with holes through which the urine escapes, perhaps not one drop passing by the natural channel. In these cases the patient makes water sitting, the urine escaping as if through the sprinkler of a garden watering-pot. Civiale[1] reports a case of urinary fistula with fifty-two external openings.

The hard lumps outside the urethra, above alluded to, do not necessarily indicate that urine has escaped from the canal. An abscess may very rarely start outside the urethra near a stricture, just as pus may form near the anus, not primarily in connection with the gut. In the vast majority of these cases, however, the first lesion is upon the urethral mucous membrane, one of the dilated follicles behind the stricture being at fault. A drop of urine is retained in a follicle, decomposes, and causes it to necrose and slough; another drop of urine is then let in, more tissue is destroyed, and more inflammatory action set up in the neighboring tissue. This process goes slowly on, a drop of urine from time to time being let into the abscess through the mouth of the follicle, which is usually kept shut by the surrounding inflammatory swelling. The abscess now is not connected visibly with the urethra; it breaks externally, and it is only after a few days that the swelling decreases sufficiently to allow a little urine to get in at the fissure in the urethral wall, and to appear at the perineal opening. Much light has been thrown by Zeissl[2] upon the agency of this follicular necrosis in allowing extravasation of urine. Such abscesses forming around stricture may break internally and let in the urine in quantity, thus forming blind internal fistula, or they may break externally, or point by both routes.

Fistulæ are conservative efforts of Nature to establish an outlet for the urine, the natural course being dammed up. They will not close until after the stricture has been relieved. They narrow down after a while into little pipes surrounded by callous inflammatory material. Sometimes a deposit of the urinary salts takes place upon their walls, and they become incrusted with calcareous matter. Sometimes they get blocked up, especially if the internal orifice is larger than the external; then a little urine collects within them and a new abscess is formed which may burrow farther and find for itself a new outlet, establishing another fistula. More rarely a small abscess may form in the prostate, and, going through the stages just narrated, opening into the urethra and into the rectum, constitute what is known as prostatic fistula; or more rarely still some small ulceration in the floor of the bladder may give way into the rectum, making a vesico-rectal fistula.

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[1] *Op. cit.*, vol. i., p. 539

[2] "Zur Perforation der Urethra," *Allgem. Med. Wien. Zeitung*, 1861, ii.

If, instead of a drop of urine escaping from the urethra into an ulcerated follicle or fissure in an ulcer behind the stricture, the ulcerated portion has given way largely, perhaps by necrosis of a group of urethral follicles, we have the serious complication known as *infiltration of urine.* More or less of the altered fluid escapes in these cases outside of the canal, and burrows at once extensively. It is a property of decomposed ammoniacal urine to destroy the vitality of living tissue wherever it comes into contact with it, unprotected by epithelium. This property does not belong to limpid healthy urine. Menzel[1] demonstrated this fact experimentally. He first used acid urine, injecting it under the skin of a dog in quantities varying from a drachm to an ounce without any bad effect in several experiments. He dissected up the skin of a dog to the breadth of four inches, and injected eight ounces of healthy human urine in four different cases. The urine was all absorbed within four days in three of the cases, in the other healthy pus formed. He repeated these experiments in the ischio-rectal fossa without bad results in five cases. To test the opinion of Simon,[2] that the compression and distention of the tissues in urinous infiltration was the cause of gangrene, Menzel performed two experiments, injecting healthy urine into the tissues with such force as to raise a tumor of the size of the fœtal head, and then prevented the escape of the fluid through the wound by means of suture. The quantity injected amounted to about half a pint, but in both cases it was absorbed without evil result within three days.

The next experiment consisted in cutting down upon the urethra of a dog and sewing up the wound so as to obtain infiltration. At each angle of the wound a fistula formed, but there was no poisoning or extensive death of tissue. He repeated the same experiment, tying the glans penis so as to cause all the urine to flow into the wound. An immense tumor formed, which only subsided when the glans penis became gangrenous and separated. The dog got well, with simply a fistula. In other similar cases he obtained the same result.

From these experiments Menzel concluded:

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[1] *Wien. Medizin. Wochenschrift*, Nos. 81–85, 1869, and *N. Y. Med. Journal*, 1871.

[2] "Chirurgie der Nieren."

1. That normal urine does not possess septic qualities, and does not produce gangrene by its chemical properties.

2. That distention by infiltrated urine does not produce gangrene.

3. That gangrene, when it does occur (on infiltration of healthy urine), is caused by contusion or the accidental inoculation of septic matter.

Menzel next experimented with urine containing soda or potash. Urine so alkalinized proved innocuous; but urine rendered alkaline by ammoniacal fermentation he found to be exceedingly poisonous, and, when injected, to cause large abscesses and cutaneous gangrene. He also injected putrid urine directly into the blood, and obtained symptoms of blood-poisoning. He further adds the clinical experience of Prof. Billroth in nine cases of infiltration. In one, the urethra was perforated by a catheter; in three, there was a crushing injury to the perinæum; in another, laceration of the urethra by a splinter of bone from the pelvis; in the rest, rupture of the urethra behind a stricture. Death followed in four cases, in two of which there was stricture, and the urine probably ammoniacal.

These results, experimental and clinical, correspond with daily experience as well as with some (personal) experiments[1] undertaken upon the human subject—since the evidence derived from dogs and rabbits has been doubted—to substantiate the fact that healthy urine, injected into the connective tissue without contusion of that tissue, is as capable of absorption as the blandest fluid. This is true at least when a small amount is used (ʒ j), a quantity certainly sufficient to establish that healthy urine, *per se*, is not destructive to human tissues. Muron,[2] an *interne* of Verneuil, stimulated seemingly by the results obtained by Menzel, performed a series of experiments by injecting urine under the skin of rabbits. His results corresponded closely to those reached by Menzel, only differing in one respect: for, while Menzel states that only urine in alkaline fermentation has destructive powers, Muron proved (upon rabbits) that urine strongly acid, dense, and full of salts, urates, etc., has the same powers to a less degree, attributable, he believes, to the density of the fluid injected, which by the law of osmosis attracts serum from the vessels instead of itself being absorbed into the latter; and again to the fact that urine, rich in urates, is apt to decompose quickly[3]

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[1] Dr. Partridge, one of the surgical staff of the Charity Hospital, injected, at my suggestion, under the skin of negroes and white patients, on many different occasions, thirty and sixty minims at a time, of healthy urine, limpid and taken indifferently from any source, the patient supposing that morphine was being injected. Absorption was perfect in every case. No abscess, no local death of tissue, followed any injection.

Dr. L. A. Stimson informs me that, in the winter of 1873, he saw Vulpian, in Paris, inject healthy human urine into the blood-vessels of dogs, in one case three and one-half ounces, without disagreeable result.—KEYES.

[2] "Pathogénie de l'Infiltration de l'Urine," Paris, 1872.

[3] That Muron is incorrect in ascribing *necessarily* destructive properties to dense acid urine, rich in urates, I think must be granted. I obtained a specimen of urine from a child with acute inflammatory rheumatism. It was strongly acid, sp. gr. 1040, and de-

Hence it may be affirmed that healthy urine does not, *per se*, kill tissue, unless that tissue be contused and inflamed (absorption thus prevented and urine allowed to decompose *in situ*), and that, with infiltration relieved by free incision, the prognosis is vastly better if the bladder were previously healthy. After urethrotomy, and operations for stone, how rare is infiltration, when the urine is comparatively healthy and has a chance to escape, although it passes over a raw surface on its way out! The practical deduction from the above is, to let out urine as soon as it has extravasated, and the chances are that serious gangrene may be averted unless the urine was strongly ammoniacal and decomposed before its escape, which is, unhappily, too often the case.

In infiltration the urine may take any one of five directions:

1. It may when small in quantity get out of the urethra, but not penetrate Buck's fascia (p. 3), in which case it may long remain confined to one spot in the perinæum as a hard, rounded swelling—like the blind internal fistula already described.

2. It may find its way rapidly through the meshes of the corpus spongiosum and cause gangrene of that body, with sloughing of the glans penis, preceded by coldness and the appearance of a black spot upon the glans.

3. It may burrow inside of Buck's fascia, but outside of the corpus spongiosum, forming a fistula opening behind the glans penis or on the back of the penis near its root, a hard ridge marking the course of the fistula within Buck's fascia.

4. It may escape behind the triangular ligament into the cavity of the pelvis.

5. It may escape outside of the common fascia of the penis, in front of the triangular ligament; in which case it rapidly distends the perinæum, the scrotum, and the connective subcutaneous tissue of the penis, and mounts up over the abdomen, and may also, more rarely, perforate the deeper layer of the superficial perineal fascia, and descend upon the thighs.

When extensive infiltration of this sort occurs, all the parts affected become œdematous; gases form in the connective tissue, causing emphysema, and making the tissues crackle when pressed by the finger. Dark spots soon appear, indicating gangrene, and extensive portions of tissue may slough away unless relief be promptly afforded.

The constitutional symptoms are those of shock. A chill usually

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posited, on cooling, a dense precipitate of pink urates which *equaled one-fourth of the volume of the liquid.* A portion of this was taken a few hours after being passed, warmed until the urates dissolved, and injected by Dr. Partridge, of the Charity Hospital, into the subcutaneous tissue of the arm, in three patients, half a drachm being used in each case; absorption was immediate and perfect. Twenty-four hours afterward three other patients were similarly injected from the same specimen, with the same dose (ʒ ss each)—only the urine was injected cold with the urates in precipitation. The bottle was shaken and the fluid resembled pea-soup. A little tenderness on pressure for a few hours marked the spot of the injection, but absorption was prompt and complete in each case, without any suppuration.—KEYES.

occurs, followed by great depression; a cold, clammy skin; feeble, quick, irregular pulse; hurried respiration; furred tongue; complete anorexia; symptoms of septicæmia, and death.

When the urine escapes behind the triangular ligament, which it does more rarely, it infiltrates deeply around the prostate and rectum well back in the perinæum, around the bladder and up behind the pubes, forming abscess in the cellular tissue of the hypogastrium, or perhaps deep pelvic abscesses.

Rupture of Bladder.—Another very rare complication of stricture analogous to infiltration is rupture of the bladder. This occurs in the same manner as the escape of urine from the urethra behind a stricture. A comparatively healthy bladder will not rupture from retention (unless, of course, mechanical violence is added—as a fall). It will become immensely distended, and then be relieved by drops (overflow) through the urethra, the latter never being totally impervious to fluid, if time is allowed for inflammation and spasm to subside, and enough continued pressure is brought to bear upon it from within. In those rare cases, however, where a sacculus has become thinned, or an ulceration exists, the bladder may give way under the pressure of distention from retention, and the urine escapes into the peritoneal cavity. The vesical tumor subsides. A fatal collapse usually soon closes the scene.[1] The urine may escape into the sub-peritoneal tissue, giving symptoms like those of infiltration behind the triangular ligament. The rarity of rupture of the bladder in connection with stricture is shown by the few cases reported. Thompson says he never saw it, and quotes Sir Everard Home as having observed only two cases. Pitha refers to a case.[2] The kidney or ureter might be ruptured in the same way through an ulcerated spot, as they are subjected to a tension as great as that felt by the bladder.

The prostatic Urethra is necessarily hyperæmic, if not inflamed behind a tight stricture, but, besides this, the substance of the prostate may undergo interstitial inflammation (abscess). The inflammation may extend down the ejaculatory ducts, seize upon the seminal vesicles, or, usually passing farther, involve the epididymis.

Epididymitis is a very common complication of stricture. It may affect one or both sides, is usually very mild in character, and leaves behind a good deal of knotty induration, which is slow in disappearing, and may block up the canal and entail subsequent sterility. A certain amount of hypertrophy, with induration of the penis, and some œdema of the prepuce, is an occasional complication of stricture. Civiale[3] accounts for these symptoms by the straining in urination, which prevents the return of venous blood, and keeps the penis congested. It is sometimes due to lymphitis.

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[1] For treatment, *see* Rupture of Bladder.

[2] Quoted from *Mém. de la Soc. Chir.*, iii., 8, 1858.

[3] *Op. cit.*, p. 141.

CONSTITUTIONAL DISTURBANCE.—The constitutional disturbance in stricture is very variable. Just as one patient may have cystitis from an amount of contraction not capable of sensibly diminishing the size of his stream, while another with a stricture only pervious to a filiform bougie, used with care, may pass limpid urine not more than three or four times daily, so also does the constitutional sympathy vary. As a rule, the latter depends upon the complications of stricture; and a patient with very tight stricture, uncomplicated, may enjoy robust health. When, however, the urethra behind a stricture begins to inflame, and the bladder to show symptoms of congestion of the neck, and cystitis; when paroxysms of urethral fever become frequent; when epididymitis and abscess come on, then the whole organism shows signs of distress. The appetite and strength fail, the skin becomes dry, pale, and harsh, the mouth coated and shiny, and the patient runs down to a shadow, a living picture of misery, while his main business in life is to pass water.

CAUSES OF DEATH IN STRICTURE CASES.—Stricture is not often fatal, except in neglected cases, such as are sometimes encountered in hospitals. Death occurs in various ways. Not to mention the rare cases of sudden death following the simple introduction of an instrument, and only alluding to rupture of the bladder, and death following surgical operations for the relief of stricture, the causes of fatal termination in cases of stricture are three:

1. Extravasation of urine, which, if extensive, kills at once by shock, or, later, by exhaustion; and blood-poisoning with suppuration, abscess, gangrene, pyæmia.

2. Uræmia, from implication of the kidneys, by the extension of inflammation up the ureters.

3. Cachexia and exhaustion, attended by pain, loss of rest, and inability to eat, due to the torment of constant unrelieved desire to urinate, and the agony and labor of the act. No more pitiable sight can be imagined than that of a man with peri-cystitis, trying to pass water every five minutes through an old tight stricture. Standing up, with his body bent forward, his head leaning against the wall, or on his knees, and half doubled up, his hands clutching at any thing within reach, he writhes and groans in agony, the sweat starting from his face, his whole body quivering and convulsed with pain. After a minute of this torture, he finds he has passed, perhaps, a teaspoonful of bloody, purulent, putrid urine, perhaps nothing at all, and he sinks exhausted upon his bed, only to renew the effort after five or ten minutes. No man can long endure torture of this sort. If the surgeon does not soon bring him relief, death will be more kind.

RECAPITULATION OF SYMPTOMS OF STRICTURE.—The *symptoms of stricture* are, briefly, narrowing of the canal, with dilatation of the urethra behind, blueness of the meatus, irregularities in the stream of urine, shreds of pus-corpuscles in the urine, pain, neuralgia of the urethra, retention of urine, overflow, dribbling, imperfect erection, irritability of the bladder, hæmaturia, impotence—from urethral obstruction to escape of semen. The *remoter results of stricture* are cystitis, with various inflammatory, functional, and structural changes in the bladder, ureters, kidneys, rectum, often terminating fatally; stone in the bladder, infiltration, perineal abscess, fistula, rupture of bladder, epididymitis, and sterility—from obliteration of the canal of the epididymis.

A word must be said here concerning the effect of the sexual element in aggravating the symptoms of stricture. This is especially true concerning all painful, neuralgic, and functional disturbances. An unmarried man frequently tortures himself with fancied ailments, which he ascribes to stricture; or declares himself strictured when the canal is sound, imploring sympathy and demanding energetic treatment. Fancied stricture, next to fancied spermatorrhœa, is a very common hypochondriacal expression of perverted sexuality, such as is found among those who heedlessly allow the brain to stimulate their erotic fancies and sexual needs, without being able to set Nature at rest by satisfying her demands, or who, on the other hand, abuse themselves sexually by physical as well as intellectual excess.

These patients require kind and gentle management. They must be put right about the cause of their troubles, and their sexual hygiene must be regulated. This can be accomplished only by marriage, or by purity of thought and absolute continence.

CHAPTER VIII.

TREATMENT OF STRICTURE OF THE URETHRA,

With Details for all Complications, and a Recapitulation.

THE treatment of stricture of the urethra, and of its results, may be considered under three heads:

1. *Treatment of Uncomplicated Stricture—*
    - (*a.*) Of Large Calibre.
    - (*b.*) Of Small Calibre.
    - (*c.*) Of the Meatus.
    - (*d.*) Traumatic.
    - (*e.*) Resilient—often irritable.
2. *Treatment of Stricture complicated by—*
    - (*a.*) False Passage.
    - (*b.*) Retention.
    - (*c.*) Retention—the Stricture being impassable.

(*d.*) Infiltration.
(*e.*) Abscess.
(*f.*) Fistula.
(*g.*) Peri-cystitis.
(*h.*) Enlarged Prostate.

3. *Treatment of Fistula with Loss of Substance.*

1. TREATMENT OF UNCOMPLICATED STRICTURE.

(*a.*) *Of Large Calibre.*—The majority of strictures which the surgeon is called upon to treat are of large calibre. The symptom of which the patient complains is persistent gleet, following gonorrhœa, or bastard gonorrhœa, with, possibly, some frequency in urination. These cases are of daily occurrence and often pass unrecognized, the gleet being treated, the stricture overlooked. Too much stress cannot be laid upon the importance of exploring the urethra, in such cases of gleet, with the bulbous bougie. One, two, or more strictures are found, the smallest, which is probably the deepest, allowing passage, perhaps, to a No. 9 bulb.

Treatment here is most simple. After the diagnosis has been made, no further instrumentation is advisable (if the patient can spare the time), until the effect of exploration has been observed. The chances of urethral chill, after first examinations, must be remembered. The patient's general condition and habits must be studied, and his urine tested for acidity, or possible kidney-disease. He must be instructed in urethral hygiene, and the nature of his malady explained to him, and he should be informed at the outset, to forestall future disappointment, that, after his symptoms have been removed by treatment, the permanence of his cure will almost certainly depend upon his own regular and intelligent use of an instrument upon himself at proper intervals, with the view of preventing tendency to recontraction of his stricture.

Being instructed not to mind the smarting at his next urination, and given such alkali, balsam, or injection, as the acidity of his urine and amount of discharge seem to call for, the patient is dismissed, to return in two days, to have his treatment commenced. The only treatment which gives satisfaction in the majority of these cases is dilatation with the conical steel sound. One of these instruments properly warmed is introduced in the manner already detailed (p. 32). Its size should correspond to that of the bulbous bougie, which has passed the stricture, and the utmost delicacy, care, and gentleness, should be used in its introduction. The wedge and lever should not be forgotten, nor should we abuse power because we possess it. At the strictured and tender points a spasmodic contraction may occur, arresting the instrument. To overcome this, patience is better than force. As soon as the instrument has entered the bladder it should be at once gently withdrawn. Nothing is gained by leaving it even for a moment. During withdrawal the stricture is usually felt to "grasp" the sound. This "grasping" is the result of muscular spasm provoked by the presence of the instrument. It will sometimes relax if the sound be allowed to rest a moment. After one sound has been withdrawn, a second and even a third may be introduced, if it is considered safe. No rule, nothing short of personal experience, can indicate how far the dilatation may be pushed at one sitting. The tendency is always to hurry and to use force; a course detrimental to rapid progress. It may be stated as a rule, subject to judicious exception, that *if a conical steel instrument of any size larger than No.* 9 *will not enter a stricture by its own weight after a little delay, when held in proper position, it should not be used.* Every urethra, however, has its own temper, as it were; some are aroused by the slightest disturbance, while others will bear considerable violence without protest. A surgeon should acquaint himself with the temper of a given urethra by gradual experiment, before he takes liberties with it. The mischief to be feared from the employment of large sounds with force, besides false passages, which are not apt to be produced by large instruments, is threefold—

1. The production of epididymitis, a common result of violence to the urethra and a complication, which suspends treatment and confines the patient for several days or, it may be, weeks.
2. The excitement of inflammation in the stricture, which aggravates its condition and defeats the end of the treatment employed.
3. The production of chill and urethral fever.

In rare instances epididymitis may come on in spite of care. The complication must be properly attended to, and all treatment of the urethra suspended until the pain in the testicle has nearly subsided and the swelling of the epididymis has assumed an indolent character. It is not necessary to wait for the latter to disappear entirely, and, if extra care be employed in resuming the use of instruments, there is little danger of provoking relapse. While using instruments in the urethra, especially at the beginning of a course of dilatation, the patient should be advised to wear a suspensory bandage to keep the testicles from exposure to injury, which would render them more liable to epididymitis.

At each subsequent visit of the patient, the surgeon commences with a sound from one to two sizes smaller than the last instrument introduced at the previous visit, and carries the dilatation as far as possible, without the employment of force—this till the full size is reached.

The most important feature in the treatment of stricture by dilatation is, a proper regulation of the intervals to be allowed between the sittings. The intervals usually recommended are too short. Occasionally we see patients who attempt to treat themselves, introducing a bougie into the urethra daily, or twice daily, perhaps at every act of urination, aggravating every symptom, worrying the urethra and bladder into a state of inflammation, and wondering why the stricture does not get well. Some surgeons, unfortunately, are guilty of the same error in a less degree. To solve the problem of the proper interval for reintroducing a sound through a stricture, it is only necessary to study the effect of a single introduction.

Suppose a stricture which sensibly diminishes the size of the stream of urine, and is attended by gleet. Through this stricture a conical instrument is introduced, which is arrested for a moment, but gradually passes, stretching the stricture, and is distinctly "grasped" as it is being withdrawn. What follows such an operation? At the next act of urination the stream is larger, and continues so during twenty-four hours. At the end of this time the stream is nearly as small as it was before the sound was used; the gleet is the same, or possibly increased. Now, for twenty-four to forty-eight hours the stream steadily becomes smaller, while the discharge grows more abundant and creamy. During the third or fourth day, improvement commences; the stream again grows larger, the discharge becomes thinner and less copious, and this improvement often continues through the fifth and sixth or even seventh days, or longer—after which the volume of the stream commences to diminish and the discharge to become thicker.

In such a case, if the same conical instrument first used had been reintroduced at the end of twenty-four hours, it would have passed the stricture with about the same facility as on the day before; if after forty-eight hours, it would enter with more difficulty; if at the end of seventy-two hours, it would again enter as easily as on the first day; if reintroduction were first attempted on the fourth day, the sound would pass more easily than at first; if on the fifth, with more ease still, and it would not probably be so tightly "grasped" on withdrawal; while in some cases the greatest ease of reintroduction is attained on the sixth, seventh, eighth day, or even later. This varies in different cases; but it may be stated, as a rule, *that it is bad surgery, in treating stricture by dilatation, to reintroduce an instrument—unless it be filiform—before the lapse of at least seventy-two hours, and that more rapid progress will be made with the case by waiting till after ninety-six hours—often even until the sixth, seventh, or eighth day.*

The reason for this rule becomes clear upon studying the therapeutic effect of pressure upon stricture-tissue. The first effect is mechanical (stretching) and sedative (quieting muscular spasm at the strictured point); this lasts twenty-four hours. The next effect is reactionary (congestive and spasmodic), resulting in extra tightness of the stricture and increase of discharge; this lasts from twenty-four to forty-eight hours. The final curative effect is absorptive. Absorption is excited by the increased activity of the circulation about the stricture, and continues for two or three days, or longer; after which, contraction and growth of stricture-tissue recommence. It is just at the period where absorption ceases and recontraction commences, that a dilating instrument can be reapplied most effectively, and this period is, in the majority of cases, on the fifth to the eighth day. In brief, *intervals of a week, especially in cases of old stricture, are generally more beneficial than any shorter period.*

That absorption takes place during the cure of stricture by dilatation may be proved during life by examining the hard cartilaginous bands often found surrounding the urethra, and constituting stricture. These bands can be distinctly felt, over an instrument introduced through the stricture, and, during the treatment, they may be observed to become gradually smaller, until they become almost imperceptible. They rarely disappear entirely.

As to the degree of dilatation which is to be aimed at, every urethra has its own gauge in the size of its meatus—provided that meatus be not congenitally small, or contracted by disease. If there is any cicatricial tissue in the circle of the meatus, or if a probe can make out any pouching below the lower commissure (Fig. 53), the meatus is strictured, and requires treatment.

The normal meatus, however, is the smallest part of the healthy canal, and the object in view is, to bring all available pressure to bear upon a morbid narrowing of some other portion of the tube. To do this the meatus must be put lightly upon the stretch. When the meatus is stretched, the feeling is one of discomfort, which subsides after the instrument has been in place for a moment. If the meatus is overstretched, a distinctly-marked, narrow, white line will be seen encircling the instrument upon the lips of the urethral orifice, indicating that the latter have been deprived of blood by pressure. So much distention is unbearable, but the greatest amount short of this should be aimed at. The average size of the adult urethra is No. 16, while 20 not unfrequently passes with ease.

As soon as a full-sized instrument will slip through a stricture by its own weight, all symptoms will usually have ceased, unless the stricture be very resilient; but recontraction will inevitably take place, and the symptoms return in time, unless the cure be maintained by the patient. This is easily done, and no intelligent patient objects to it. He acquires the art of gently passing a sound upon himself in a few lessons, and he should be seriously cautioned to perform this trifling but important operation at first weekly, then fortnightly, then monthly, studying his own case to determine how long an interval he can allow without sensible recontraction of his stricture. In this way, in some cases, the use of instruments may be gradually abandoned; in the majority it will have to be continued indefinitely, at intervals varying from a week to several months. In this way does the cure become radical. The surgeon is responsible for the cure only on condition that the patient carries out this plan; or, rather, the patient is responsible for the permanence of his own cure, and this he must be made distinctly to understand.

(*b.*) *Stricture of Small Calibre.*—To this class belong strictures admitting any instrument less than No. 9. They are arranged under a special head, not because they require different treatment, but in order to emphasize the fact that by far the greater number of such cases are better treated with soft than with steel instruments. The danger of making a false passage in an obstructed urethra with a small metallic instrument cannot be overrated. No one can appreciate the ease with which false passage is made, until he has himself made one. Indeed, it is not very uncommon for a patient or surgeon, not well acquainted with the urethra, to make a false passage, and go on dilating it instead of the stricture, wondering meantime that the size of the stream is not increased or the symptoms alleviated. A surgeon who knows every line of the urethra may occasionally assume the risk of using a small metallic instrument in the canal without a guide, but only in exceptional cases. Below No. 9 soft instruments only should be employed, unless there be a guide through the stricture.

Dilatation is carried on as already directed, steel instruments being used as soon as the stricture will admit 9. Progress is slower with soft than with steel instruments; they usually give the patient more pain; the intervals between their introduction may be somewhat shorter.

Cutting (internal urethrotomy) and stretching (divulsion) operations are growing daily in favor in the treatment of strictures of small calibre; yet, in a case of uncomplicated stricture, no matter how tight it may be, provided it does not prove resilient, and is not of traumatic origin, if any instrument at all can be passed, dilatation is still the best method of treatment. Scarification and divulsion are only helps. They are attended by danger. They do not cure radically. The sound must be used after them. When pursued with gentleness and care, the patient need not lose a day from business on account of treatment by dilatation, nor be confined an hour to the house; while the risk of exciting complications is at a minimum. The treatment is longer surely, but, if the surgeon will imagine what would be his own wish were he in the patient's situation, he will not hesitate to adopt the safer but more tedious method.

For the class of strictures (uncomplicated) now under consideration, exception may be made in favor of divulsion or internal urethrotomy in two classes of cases:

1. If the patient cannot give enough time to carry out dilatation properly.
2. If pretty severe urethral fever follows attempts at dilatation (Case XI.).

In commencing the treatment it may be impossible to enter the bladder with any instrument, either on account of the tightness of the stricture, or because the point of the instrument does not engage in the latter, or is arrested by some fold or lacuna beyond. In these cases gentle perseverance and skill will rarely fail of success. The different varieties of filiform bougies, with the different manœuvres and expedients of introduction already detailed (p. 104), rarely fail to triumph over all difficulties. Sooner or later the bladder is reached,[1] and the case is under control. On the third or fourth day the same filiform instrument will pass with greater facility, and a larger one will usually follow: the treatment by dilatation is fairly under way.

In those exceptional cases just alluded to, where a filiform bougie only can be introduced after long and persevering effort, it becomes a serious question whether it is not better to utilize the guide thus introduced through the stricture, to conduct another instrument upon it, rather than to run the risk of retention from swelling of the stricture after the guide has been removed, and perhaps incur the necessity of operating under less favorable circumstances. The temptation to operate in these cases is great, but the necessity for it is often more apparent than real. True, if the stricture be very tight, retention may result from disturbing it, especially if the urine be acid, but this retention yields to heat and opium, or the same filiform instrument, which caused the trouble, may usually be reintroduced; finally, the aspirator might be used: in any case, after seventy-two hours, a larger instrument will rarely fail to pass, and dilatation has commenced to effect a cure. Hence, in all these cases, where the patient can afford the time, dilatation is the preferable, because the safer, treatment.

In the so-called impassable stricture (uncomplicated), where urine passes out, but no instrument can be made to enter the bladder, a filiform bougie can invariably, with patience, be inserted into the orifice of the stricture. That it has entered is known by the "grasping" of the instrument by the stricture. If now the bougie be left engaged during eight or ten minutes, the muscular spasm constituting the "grasp" may yield and allow it to advance; if not, another attempt may be made in twenty-four or forty-eight hours, when, if it will not pass, it will at least enter the stricture to a greater depth; finally, skill will overcome it and the surgeon advances to higher numbers. Model bougies are useless. Whalebones are superior to all other means.

In any of the above cases, if, after sufficient deliberation, it is decided to enlarge the stricture before withdrawing the guide, a choice of operations must be made. If it is only intended to enlarge the stricture sufficiently to make its entrance by a dilating instrument more easy after a few days, if the guide be a soft filiform bougie furnished with a screw, a larger bougie or silver catheter may be screwed into it, and the compound instrument carried into the bladder; or, if the guide, as is usually the case, be a whalebone bougie, a tunneled sound may be slipped over it and gently but firmly carried through the stricture, a little force being used, but at the same time great care taken not to bend the guide in front of the advancing instrument (p. 104).

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[1] In one (personal) case it required ten sittings, most of them over one hour long, before any instrument could be made to enter the bladder. On the tenth effort, the instrument passed. I entered the bladder and at once divulsed the stricture. In two weeks the patient passed his own full-sized instrument.—KEYES.

If it is intended to relieve the stricture at once, the broad rule is—*all strictures of the pendulous urethra, if operated upon, should be cut; all strictures of the fixed urethral curve should be divulsed*—unless external section is necessitated by circumstances. Bleeding from the pendulous urethra can always be controlled by direct pressure; not so easily that from the bulb or membranous urethra. The operative procedures have been detailed (Chapter VI). As for the result of these operations, either of them will afford immediate relief; shock seems to be about the same in either case; neither will effect a radical cure, and that one is to be preferred which is most convenient and attended by the least pain and danger. This operation is divulsion with Thompson's instrument.

If a stricture of the pendulous urethra is so small as to require immediate radical measures, it should first be stretched by Thompson's divulsor on a guide, until it will admit Civiale's urethrotome, or Maisonneuve's urethrotome may be used at once.

(*c.*) *Stricture of the Meatus.*—Stricture at or very near the meatus is usually made worse by attempts at dilatation beyond a certain limit, after which it becomes irritated, inflamed, and refuses to dilate. To a still greater degree is this true of congenital or cicatricial narrowing of the meatus. In all of these cases, the contraction must be cut with Civiale's concealed bistoury, scissors, or knife, toward the floor of the urethra alongside of the frænum. The orifice should be cut a little larger than it is estimated to have been the original intention of Nature to make it, since slight contraction necessarily takes place in healing. Hæmorrhage, in this operation, is considerable, if the corpus spongiosum be cut into. It may always be arrested, as already described (p. 120).

Reflex irritation may produce spasmodic stricture in these cases, so that the next attempt to urinate is perhaps ineffectual. Removing the collodion, dipping the penis in warm water, and reassuring the patient, will invariably bring a flow of urine. A meatus, properly cut, remains open indefinitely, without the necessity of dilatation.

Where the narrowing of the meatus depends upon an extensive cicatrix, left behind by soft chancre or other ulceration, and where meatotomy is unable to keep off subsequent gradual recontraction, the operation of Colles[1] should be substituted for simple incision. This consists in dissecting off whatever parts of the frænum or prepuce remain attached, and slitting the floor of the urethra for half an inch. The mucous membrane of the canal is now dissected up on both sides, a portion of corpus spongiosum is cut away, and finally the mucous membrane is attached laterally on either side by points of fine suture.

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[1] "Practical Observations on the Venereal Diseases," London, 1837.

(*d.*) *Traumatic Strictures* are not usually amenable to treatment by dilatation. They are so exceptionally tough, hard, and retractile, that a splice or splices must be put into them, by rupture or section, in order to keep them open. Since the days of Syme, it has been customary to consider perineal section indicated, wherever stricture of the membranous urethra was of traumatic origin. This rule has ceased to hold good since the improvement of urethral instruments. On the contrary, it may be affirmed that permeable uncomplicated traumatic stricture is best treated by divulsion, if it be deep-seated in the urethra, by internal incision, if it occupy the pendulous portion of the canal. The following case shows the toughness of traumatic stricture, and substantiates the above assertion:

CASE XXI.—A healthy farmer's boy, of seventeen, was brought to New York in June, 1869, for relief from retention, with overflow. Two years previously he had injured his perinæum by a fall upon a board. Gangrene followed. When the slough separated, his physician saw "both ends of the urethra separated by more than an inch." Sounds were passed at first, but, after six months, the patient ceased putting the instrument into his bladder. At date of application, no instrument had entered the bladder for eighteen months. A week previously, the patient had complete retention. He was then etherized by his physician (Dr. Case) for the purpose of operation. Under ether, the bladder partially emptied itself, and nothing was done. Overflow continued; there was not much cystitis; the patient was brought to New York for operation.

After careful manipulation, without ether, for two and a half hours with all varieties of instruments, Thompson's probe-pointed catheter was at last passed into the bladder, by the exercise of some force, and clear water flowed through it. Not a drop of blood flowed during the two and a half hours' manipulation. The instrument was withdrawn, and a similar one of larger size passed. This was followed by Thompson's divulsor without a guide, a strong instrument, selected by Thompson himself, manufactured by Weiss. This was screwed up, *but broke at* 15. It broke just where a properly-made instrument always does, if it break at all, one blade snapping just where the two are joined. The stricture, however, fortunately cracked just as the instrument gave way. The divulsor was withdrawn without trouble, and a No. 14 conical steel sound introduced into the bladder. On the following day, a full-sized (15) sound passed easily, and the patient started for his home (one hundred and fifty miles distant), where he arrived safely. His physician, who was in New York two years later, stated that the patient had continued perfectly well, introducing No. 15 every week.

Here was a stricture as dense and hard as it was possible for a stricture to be—hard enough to break an instrument of the best make—yet cured by divulsion.

As a general rule, however, if the rigidity and extent of stricture be particularly great, if it be complicated by numerous or large fistulæ, or if the stricture be impassable, it is advisable to operate externally, as this gives the surest chance of relief.

(*e.*) *Resilient Stricture.*—Strictures which are thoroughly resilient will not dilate (Case XV.). In such cases, if a given instrument be introduced, the stream becomes smaller at once, and on the fourth day the same instrument enters with more difficulty, or perhaps will not pass at all. These strictures are frequently irritable as well as resilient, and always demand divulsion, with the employment of enough force *to crack the stricture*, or internal urethrotomy.

Many strictures, however, which respond to dilatation at first, fail to do so after they have reached a certain size. To this class belong all strictures at or very near the meatus, and many at other portions of the canal. In these latter cases, although a full-sized conical sound may readily pass, yet a bulbous bougie, many sizes smaller, introduced immediately after the withdrawal of the sound, is arrested by the stricture, while the symptoms (gleet, etc.) fail to disappear entirely. In these cases Otis's divulsing urethrotome is the best instrument to use, to put a splice into a stricture which has received all the benefit dilatation could give it, without being made quite large enough.

2. Treatment of Stricture complicated by—

(*a.*) *False Passage.*—False passage, as already stated, results from rough or unskillful use of small instruments in an obstructed urethra. It may be due to "forced catheterism," a barbarous procedure, condemned by its name alone, which consists in passing a metallic catheter up to the obstacle, and then forcing it along in the supposed course of the urethra, until urine flows through it, if haply this occur at all. It is not used at the present date. False passages start from the bottom of lacunæ (Fig. 30), from the front face of a stricture, from in front of the triangular ligament, or from some abscess (Fig. 55). When a surgeon

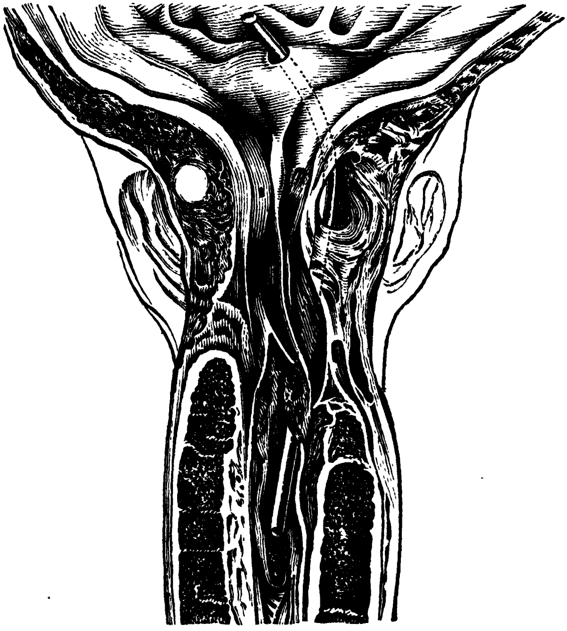

Fig. 55.—(*Dittel.*)

makes a false passage, he may be unconscious of the escape of the point of his instrument from the canal, but he will soon perceive that it is behaving unusually. It does not glide along as if in a healthy urethra; it is obstructed, but yet not held in the same manner as if in the grasp of a stricture. The point, moreover, seems often to be turned out of the median line, and, after the instrument has been introduced far enough to have reached the bladder, a rotary motion, imparted to the shaft, will show that the point is fixed in the connective tissue, and not freely movable, as it would be in the cavity of the bladder. In such a case a finger in the perinæum, or, better still, in the rectum, will almost certainly feel the point of the instrument just outside of the wall of the gut, at the apex of the prostate, or perhaps lying between the prostate and the gut. On withdrawing the instrument, blood flows freely from the meatus.

The treatment for a fresh false passage of this sort is, to let it alone absolutely for two weeks, if the patient can make water, and is in no pressing need to have his stricture relieved. Blood will flow for a day or two, then pus for a few days, and at the end of two weeks, in favorable cases, the passage opened by the instrument will have closed. Occasionally it remains open, suppurating for a much longer time. Urethral fever, with or without the formation of abscess, is not an uncommon result of false passage. Infiltration of urine is exceedingly rare. The great danger in these cases is in recommencing instrumentation too soon, entering the false passage before it has healed, and thus keeping it open indefinitely.

In avoiding an old false passage, which is the seat of chronic suppuration, its position must be accurately studied out, by observing at what point in the urethra an instrument engages in it, and from which wall of the canal (upper or lower) it starts. The orifice of a false passage once accurately located, may be subsequently avoided by making an effort to present the beak of the instrument at a different portion of the canal, when passing the dangerous point. A new false passage does not grasp an instrument like a stricture, and in this way can often be distinguished from the latter. An old false passage, however, so far as its pathology is concerned, is a traumatic stricture. It has hard walls, and the unstriped muscle of the erectile tissue around it will "grasp" like any other stricture, thus depriving the surgeon of a very valuable means of deciding whether he is in the strictured canal of the urethra or not.

Another means, already alluded to, of avoiding a false passage when searching for the orifice of a narrow stricture, consists in filling the urethra with whalebone filiform bougies, thus mechanically filling up the false passage, until some instrument will glide by its orifice, and enter that of the stricture. This course, or that of using a spiral-pointed whalebone bougie, with its point out of line (Fig. 39), should be employed in entering the stricture, whenever the symptoms are urgent, and false passage exists.

When a guide has passed the stricture, the latter may be divulsed, or cut, immediately. The size of the beak of the full-sized instrument, subsequently passed, will insure it from entering the false passage.

If it is impossible to get through the stricture, and there is retention, it becomes a matter of personal judgment to decide whether to perform external perineal urethrotomy without a guide, or to use the aspirator, and endeavor to pass the stricture at another sitting.

(*b.*) *Retention.*—A patient, with stricture, may be enjoying good health, when suddenly, after exposure to cold, after a dinner or a carouse, or after the passage of a small instrument through his stricture, he finds that he cannot pass water. If he does not get relief, his bladder will fill up, and after twenty-four to thirty-six hours, most of which are passed in acute suffering, a little urine will force its way through the stricture, and he will have overflow, often inaccurately styled incontinence. Such an over-distention of the bladder is liable to give rise to atony and cystitis, and, if the patient is seen before it has occurred, every means should be employed to avert it, and to preserve the bladder from an injury the effects of which are always more or less permanent. The most frequent cause of retention in stricture cases is sudden acute inflammation of the membrane lining the stricture, by which the already narrow canal becomes occluded. In this condition, as a rule, a fine catheter, or filiform bougie, can be introduced through the stricture, by the exercise of patient gentleness and skill. If the bladder can be reached, a flow of urine will follow the withdrawal of the instrument. If the bladder cannot be reached, the patient should be placed in a hot bath, more hot water being added after he has become accustomed to the first heat, and this carried as high as is bearable. He should remain in the bath from fifteen to twenty minutes, and will often be able to empty his bladder while in the water. Another excellent expedient is the use of the sitz-bath, at a temperature of 100° to 104° Fah., more hot water being added after the patient has entered the bath, which should be continued only for about three minutes, and may be repeated after an interval of fifteen minutes. If the heat is sufficient to induce nausea or faintness, it is more likely to produce the desired effect of relaxing the stricture.[1] A piece of ice in the rectum every few minutes may be tried (Cazenave).

Failing in these expedients, if percussion reveals a bladder only slightly distended, reaching not more than half-way up to the umbilicus, opium may be given, one grain being administered every hour until relief is afforded. The nervous excitability attending retention is relieved by opium. The pain will soon cease, the patient's fears will become quieted, and after the fourth or fifth grain urine will generally flow. Twenty-drop doses of the sesquichloride of iron, administered every fifteen minutes, for a couple of hours, at the same time with the opium, seem to facilitate relaxation of the stricture. Finally, an instrument can often be introduced under the entire relaxation of anæsthesia.

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[1] In a robust and full-blooded subject, it might, perhaps, be advisable to take blood from the perinæum by a number of leeches.

In a case of retention, if a filiform bougie can be passed into the bladder, the advantage so gained should not be lost, but the stricture should be divulsed at once, if the history of the case show an advanced srricture, and there are no evidences of kidney-disease. If no instrument can be passed, we have impassable stricture, with retention, which requires other means for its relief. In drawing off the urine from a bladder suffering from overflow, it is wise never to empty the viscus entirely, at first, if it has been long over-distended. Fatal collapse has been caused by such a course, and subsequent inflammation of the overstretched mucous membrane is more likely to run high if all the tension be taken from it at once. Half or three-quarters may be withdrawn, the bladder being emptied entirely on the following day. This fear of collapse from emptying an over-distended bladder mainly applies, however, to old subjects suffering from enlarged prostate, and stagnation of urine.

(c.) *Retention, the Stricture being impassable.*—No stricture (congenital atresia excepted) is impervious unless the urethra has been cut across and united anteriorly, all the urine escaping behind it, or unless stricture has gone on contracting for an indefinite period, the urine escaping through large fistulæ. Where a drop of urine can pass, the stricture is pervious, but nevertheless it may be impassable to any instruments we may use, or any skill and patience we may bring to bear upon it, and that, too, where the urine flows in a considerable stream. Treatment of impassable stricture without retention has been already described (p. 154).

When, however, there is retention, the question immediately arises, Is it better to operate on the stricture at once, or to puncture the bladder and wait till the following day, in hope of operating then under the more favorable conditions of a guide through the stricture? This is a point which requires the best judgment, aided by considerable experience, to decide correctly. Here there is no question of any other complication. The surgeon is in face of an impassable stricture, and the patient has retention, and must be relieved, or his bladder will suffer. If the patient has had retention before, his experience then will aid in forming a judgment. If the surgeon is acquainted with the temper of the urethra, and the character of the stricture (resiliency, traumatic origin), he may found his opinion on such previous knowledge. If the patient is difficult to manage, and there is fear that, once relieved from his present necessity, he may not submit to treatment, it would be only a kindness to him to take advantage of his misfortune to insist upon perineal section at once, and put him in the way of passing a large instrument and keeping off further trouble, thus relieving retention, and subjecting the stricture to effective treatment by one operation.

But external perineal urethrotomy without a guide is an exceedingly difficult operation, and is not to be undertaken unadvisedly. If it is the patient's first retention (brought on by exposure), and if he was previously passing a moderately good-sized stream, if the bladder is not already too full, it is always well to try warm baths and opiates to relieve retention and to leave the stricture for subsequent treatment. Again, if the bladder is very full, and there is still no absolute necessity for external perineal urethrotomy, the bladder should be punctured above the pubis, with the aspirator, and a filiform bougie engaged if possible in the orifice of the stricture, and left to act by continuous dilatation (p. 165). On the following or next following day the filiform bougie will generally pass into the bladder, and then the stricture will be under control.

NAWAB SALAR JUNG BAHADUR

(*d.*) *Infiltration of Urine.*—In stricture complicated by extensive infiltration of urine, we have a condition requiring prompt action on the part of the surgeon. The stricture must be relieved. The infiltrated urine must be drained off, or extensive abscesses, with sloughing, will follow, and the patient's life be placed in imminent peril—results which may ensue in spite of all precautions. When the infiltration has occurred behind the triangular ligament and is confined to the cavity of the pelvis, but little can usually be done, except to keep up the strength by brandy, carbonate of ammonia, and beef-tea, trusting that Nature will set up a plastic inflammation and thus limit the burrowing of the infiltrated fluid, and allow its escape by the formation of abscess (pericystitis). Even in these cases, however, desperate as they are, where the escape of urine has been sudden and in considerable quantity, early operation is often the only chance. They are similar to, and must be treated like, cases of rupture of the bladder, the neck of the bladder being cut into, as in the lateral operation for stone, all stricture-tissue being divided and a chance given for the infiltrated urine to escape, while further damage from infiltration is rendered impossible.

If infiltration occurs along the course of the urethra outside of the triangular ligament, and is slight and circumscribed, the urine not having penetrated Buck's fascia, but manifesting itself in a hard, circumscribed perineal swelling (p. 142) behind the stricture, no surgical interference is called for, so long as the hard lump is not rapidly increasing, and the patient can empty his bladder. Should retention occur under these circumstances, or the hard lump commence to enlarge rapidly, external perineal urethrotomy is the only proper resource. In this variety of infiltration there is often time to build up the patient's general condition by the judicious employment of hygiene, air, tonics, etc., and sometimes to avert the consequences of long-continued abuse of stimulants, including delirium tremens, often imminent in cases encountered in hospital practice. Should external perineal urethrotomy be performed, the hard lump must be incised in the median line, and the stricture thoroughly divided.

But these indurations do not necessarily suppurate externally. They usually remain stationary for a long time, often get better under treatment, sometimes (rarely) spontaneously subside, probably by discharging internally through a small orifice.[1]

When a large quantity of urine has suddenly escaped, burrowing into the subcutaneous tissue of the perinæum, scrotum, thighs, and abdomen, large, free incisions, calculated to insure effective drainage, should be made well down into the subcutaneous tissue, wherever œdema or emphysema is felt, and external perineal urethrotomy must be performed. A thorough division of the stricture prevents further infiltration. If the scrotum be infiltrated, it should be split into two lateral halves, while other incisions may be made freely into its substance. Too free incisions are not to be feared; the error is on the other side. Incisions must be bold, deep, numerous, and should extend over all the surfaces involved by infiltration. The operative indications, in cases of extensive infiltration, are three:

1. To stop progressive infiltration by extensive dependent incisions.
2. To provide an escape for urine constantly collecting in the bladder, by free central incision of the urethra behind the stricture.
3. To divide the stricture thoroughly, although this may be left for a subsequent operation.

In making incisions, a finger in the rectum should search for boggy spots, which, when found, should be opened into. Brandy and carbonate of ammonia, freely administered in small, frequent doses, will bring down the pulse as the patient rallies from shock. The subsequent treatment must be sustaining in every way. Erysipelas is apt to come on.

Gangrenous spots appearing after incision should be poulticed with charcoal or yeast, and linseed-meal until they separate, and the raw surfaces afterward dressed with simple stimulating applications until they heal. Recoveries after infiltration seem sometimes almost miraculous, and life is not to be despaired of even in cases of the most extensive sloughing. Too much attention cannot be bestowed upon keeping up the patient's strength. This is his salvation; it must be maintained at all hazards.

(*e.*) *Abscess*, complicating stricture, has already been described as perineal abscess (p. 79), and as a hard, circumscribed swelling in the perinæum attached to the urethra (p. 142). For all these, when complicating stricture, the treatment which usually yields the best results is external perineal urethrotomy, including the abscess and the stricture in one free median incision. The opening should be made before fluctuation can be detected, at any time if the bladder is suffering. Success of treatment usually depends upon the earliness and freedom of the incision: *cut deeply in the median line.* There is nothing to fear. Hæmorrhage can always be restrained by tying spurting points or plugging the wound if necessary around a "shirted canula," or by a piece of fine sponge through which a female catheter has been passed.

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[1] Dr. E. A. Banks, of New York, brought a patient for inspection, who with tight stricture had two of these deep perineal indurations, one as large as a pigeon's-egg, evidently firmly attached to the urethra. Before agreeing to external section, which was advised, Dr. Banks tried "continuous dilatation," with the effect of overcoming the stricture, and causing the disappearance of the indurations after a few weeks. The treatment, however, provoked epididymitis, and caused some urethral irritation.

(*f.*) *Fistulæ*, as complicating stricture, are important just in proportion as they are large, long, or numerous. A simple fistula with one or two openings, which allows a few drops of urine to escape at each act of micturition, need not be regarded. Such a fistula will close spontaneously, in the vast majority of instances, as soon as the stricture has been dilated fully, as Brodie pointed out. The first and essential step in the treatment of all fistulæ complicating stricture is, to remove obstruction to the free escape of urine, and then to treat the fistulæ, if they do not get well spontaneously. Such after-treatment will rarely be required unless there has been loss of substance. If, however, after *full* dilatation has been maintained for some months, the fistulæ still allow urine to pass during micturition, the following expedients may be resorted to:

Dilatation being maintained, the patient should be further taught the use of a flexible (French) olivary catheter of medium size. This he must introduce at intervals, passing no urine except through the catheter, if it can be done without producing urethritis. If this fail, after thorough trial for a month or more, where the stricture has been fully dilated and is not resilient, the hard edges of the fistulous tract should be incised and cleaned, and the fistula left with its external larger than its internal orifice. If the edges are not callous, and particularly if the fistula is long and deep, cauterization is sometimes effective. This is best accomplished by galvano-cautery, a wire being introduced, suddenly raised to white heat, and instantly withdrawn. Red-hot iron is not reliable, as it becomes cooled on introduction, and produces least effect where most is required, i. e., at the internal orifice of the fistula. Another expedient is to bend a silver probe until it readily traverses the whole length of the fistula, coat it with fused nitrate of silver, introduce it rapidly, and rotate it during withdrawal.

It must not be forgotten that these means last detailed are only accessory to the sound, and by no means in themselves reliable for cure. During their use the catheter and full-sized sound should be continued unremittingly. In general, the capacity of the urethra is underrated, and fistulæ which do not get well owe their intractability to the fact that the stricture has not been brought to the full size of the canal. If the urine can flow out freely enough, it will choose the larger and neglect the smaller channel, allowing the latter to heal. Tonic contraction of the urethra in front of stricture, due to long inactivity of the canal, seems to be the obstacle in some cases. A search, in the track of fistulæ which refuse to close, will sometimes reveal stone as the cause.

Where from the mismanagement of previous abscess there are numerous fistulæ, opening in all directions around the penis, scrotum, and perinæum, running through indurated tissue, and, perhaps, lined by calcareous matter; or where fistulæ coexist with abscess in the perinæum, or a lumpy induration of some extent around the urethra—in any of these conditions sound surgery calls for external perineal urethrotomy. The incision should be central, all abscesses and fistulous tracts being opened into this, and every thing forced to heal from the bottom.

When a fistula has one opening in the *rectum*, the obstacle to success of treatment is often the passage of fecal matter and gases into the urethra. If, after cure of the stricture, simple means (cautery, incision) fail, Sims's silver suture with forced dilatation of the sphincter ani might become necessary.

(*g.*) *Peri-cystitis, or Advanced Interstitial Cystitis.*—In nearly all cases of stricture there is necessarily more or less cystitis (inflammation of the mucous lining of the bladder), especially about the neck, but, in the majority of cases, the bladder complication does not influence, in any degree, the treatment which the general conditions of the stricture call for. Where, however, active interstitial cystitis complicates a tight stricture, or where the muscular substance of the bladder and surrounding tissues are much involved, rest must be given to the bladder, and this is usually best effeted by external urethrotomy, if any active measures are allowable; otherwise a supporting and stimulating general treatment gives Nature the only chance (and that a poor one) of bringing the patient safely through. Particularly in all cases of cystitis is it necessary to make the urine unirritating as it flows from the kidney, to alkalinize it through the stomach, that it may be less alkaline at the meatus. G. Owen Rees[1] has demonstrated the possibility of doing this, by giving alkalies by the mouth, thus rendering the urine alkaline or neutral at the kidney. Alkaline urine, with a fixed alkali, does not irritate the bladder, and consequently less mucus is secreted (than when the urine was acid), to act as a ferment, decompose the urea, and give rise to the formation of carbonate of ammonia, that powerful volatile alkali which is the agent in decomposing urine most active in irritating and inflaming the bladder, and which, indeed, gives the alkaline reaction to the urine of chronic cystitis. Lemon-juice in quantity, and benzoic acid, will render the urine of a healthy individual acid; not so when the bladder is inflamed; then alkalies are more likely to produce the desired effect.

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[1] On the "Pathology and Treatment of Alkaline Conditions of the Urine," Guy's Hospital Reports, Third Series, vol. i., 1855, pp. 300, 301.

(*h.*) *Enlarged Prostate.*—The complication of stricture by enlarged prostate is not of common occurrence. The situation is always grave when the two conditions coexist, if the enlargement of the prostate is sufficient to interfere with the passage of instruments into the bladder, and the stricture is situated as deep as the bulb, or beyond it. The tighter the stricture the more serious does the complication become, and, should retention supervene, the difficulty of the situation is apparent at once, whether the obstacle to the escape of urine be situated at the strictured point or in the prostate.

If the stricture is in the pendulous urethra, it may be dealt with by nearly any one of the means already described. It may be kept dilated with a straight steel sound of proper size, very conical, and not over five inches long (Fig. 56), while the proper treatment is applied to the bladder laboring under prostatic obstruction. If the stricture is deep-seated and not very tight, but if neither short instruments nor the short curved sound will pass the prostate, a silver catheter of long curve should be selected, which will enter the bladder through the enlarged prostate, and steel conical dilating instruments should be constructed of the same curve. When the urethra has been dilated, the sound may be replaced by the catheter to be habitually used. If the stricture is not large enough to materially obstruct the urethra, and retention occurs at the neck of the bladder, the prostate would require all the care, and the stricture might be subsequently attended to, after passage for some instrument into the bladder had been established.

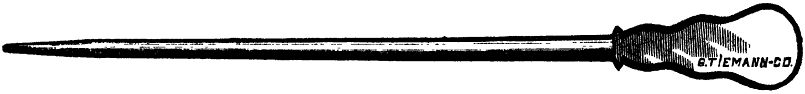

FIG. 56.

If the stricture is very small, so as to admit only a filiform bougie, there still being no retention, a course may be followed which has been recommended at one time or another for nearly every condition of tight stricture, but which, indeed, is rarely advisable, as we have so many that are better, namely, the tying in of an instrument which has passed through the stricture. It is known as "continuous dilatation."

Continuous Dilatation.—The execution of the treatment and its action are as follows: A filiform bougie, whalebone or soft, is passed through the stricture, which "grasps" it tightly, and is tied in (Chap. X.). The first action of this instrument upon the stricture is to cause irritation. The muscular fibres of organic life which surround the urethra at the point of stricture contract tightly upon the instrument, producing the "grasping" so often referred to. This continues for a while and then subsides; mean time, if the patient tries to pass water, he finds himself unable to do so. Soon the spasm relaxes and the urethra widens notably, so that a few hours later the patient can make water easily outside of the instrument. A knowledge of this fact relieves all fear of retention in connection with this style of treatment; the fear is, indeed, on the other side, for if a soft filiform instrument has been tied in, no matter how tightly it was embraced by the stricture at the moment of introduction, the chances are that at the second or third micturition it will be doubled up and washed bodily out of the canal by the volume of the stream of urine. This is not so apt to happen where there is also enlarged prostate, on account of the smallness of the stream and the atony of the bladder frequently attending that condition. After the instrument has been tied in for twenty-four hours, the stricture will readily admit a larger bougie. This should be tied in the same way. The stricture ulcerates superficially, but widens with great rapidity. After it has reached a certain size, it may be treated by dilatation as described above.

There are objections to the treatment of stricture by continuous dilatation. Some patients suffer torments if an instrument is tied into the urethra, while urethral fever and epididymitis are often caused by it. On the other hand, some patients support it with perfect impunity, even while walking around. If severe chills come on during continuous dilatation, it is prudent to withdraw the instrument; if the chills are mild, they may be disregarded. Strictures enlarged by continuous dilatation commence to recontract at once with great rapidity, unless they are kept dilated by the occasional use of the sound.

Finally, if the stricture is exceedingly tight, perhaps impassable, and retention has come on, caused either by the stricture or the prostatic enlargement, there is but one course left open. If warm-baths, etc., do not bring relief, and the bladder is found to be fully distended, the operation of tapping above the pubes must be performed, either with the aspirator or by incision, leaving a canula tied in (p. 130), the choice of the former operation resting upon the probability of an easy and speedy effective cure of the stricture, the urethra and prostate being treated after the bladder has been relieved. In these cases external perineal urethrotomy is too severe an operation, for the patients are all old men with more or less cystitis, coexisting with prostatic enlargement.

3. Fistula with Loss of Substance.[1]

Fistulæ of the urethra with loss of substance may result from gangrene, abscess, phagedenic ulceration, simple ulceration (the tying in of a silver catheter for a length of time). They are seen usually as the result of infiltration and abscess complicating stricture. In this variety of fistula a hole exists in the floor of the urethra, through which its roof is visible. As has been shown, small fistulæ close on dilating the urethra. The same law which causes a traumatic stricture to close entirely, if all urine escape through fistulæ behind it, will the more certainly close a small fistula, unless from obstruction in front of it, and consequent distention of the urethra during urination, fluid be forced into its internal orifice. With loss of substance, however, dilatation of the urethra, though necessary for cure, will not alone suffice. If the opening is larger than a pea, its closure is often difficult, especially if it lie anterior to the peno-scrotal angle. The causes of failure here are three:

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[1] All large fistulæ are considered here, whether complicating stricture or not.

1. The thinness of the natural tissues furnishing only narrow edges for the union of flaps.
2. The difficulty of avoiding contact of urine with the cut edges.
3. The disturbance of the wound on account of changes in size of the organ (erection).

Where loss of substance, however, is not very great, if there be no urethral obstruction in front of the fistula, repeated cauterizations may effect a cure. In this way Sir Astley Cooper[1] closed a fistula as large as a pea with nitric acid, after two operations with harelip pins and interrupted suture had failed. He states that this plan will not succeed unless the integument is loose, and the scrotum forms part of the orifice of the fistula. Dieffenbach[2] prefers a concentrated tincture of cantharides for small openings, which he applies as follows: The urethra is distended over a full-sized bougie, and the tincture applied with a small brush to the inner border of the fistula. This manœuvre is repeated several times in the twenty-four hours. The epithelium as it loosens must be scraped away, and the tincture applied to the raw surface until healthy granulations have sprung up, which seem capable of closing the opening. Failing once, the treatment may be repeated.

If this is not sufficient, or if, at first, the opening seemed too large to warrant the simple application of caustic, its use may be combined with that of Dieffenbach's lace suture (Schnürnaht), which is applied as follows: After the epithelium has been removed by the application of the tincture of cantharides, as just detailed, and a large, soft bougie has been passed into the urethra, a small curved needle, not cutting at the sides, carrying a stout (waxed) silk ligature, is introduced with a needle-holder at about three lines from the border of the fistula. The point of the needle must not enter the urethral canal, but, after traveling a short distance in the substance of the corpus spongiosum, it is made to emerge through the integument at a point also about three lines distant from the edge of the fistula. The needle is reintroduced at the same puncture whence it emerged, and the same stitch is repeated often enough to carry the thread around the fistula at a distance of about three lines from it, and to make it finally terminate through the puncture in the integument where it first entered, thus leaving the two ends of the thread emerging from the same cutaneous orifice, the thread itself lying in the corpus spongiosum, and the urethra not having been punctured by the needle. By gently pulling upon the two strings, the raw edges of the fistula are now brought together. The ligature is tied, the knot sinking into the cellular tissue; the sound is withdrawn, and water-dressing employed. The patient urinates through a catheter. In three or four days the ligature is cut and gently drawn out. Two operations may be required, the first rendering the fistula smaller, the second obliterating it. This procedure is applicable to all fistulæ of the spongy urethra of less than one-sixth inch diameter.

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[1] "Surgical Essays," London, 1819, p. 205.
[2] "Die Operative Chirurgie," Leipsic, 1845.

Where the opening is larger, urethro-plasty is required. Urethroplastic operations are very unsatisfactory in their results, even in the hands of the best operators, for the reasons already given. For the proper method of operative procedure each case must be made a study by itself, and the flap so chosen that it may be ample in size and sufficiently thick. In the present treatise it is impossible to give even by name all the operations which have been proposed, much less to describe them. For such detail those interested are referred to Dieffenbach,[1] where fourteen different methods are described.

The excellence of one operation, however, the sliding flap or bridge method of Dieffenbach, and variously modified by Nélaton and others, is worthy of outline from its frequent applicability to small fistulæ anterior to the scrotum. A large bougie is introduced into the urethra, and upon it the integument of the penis is incised transversely or longitudinally, by two parallel incisions, situated respectively nearly an inch from the edges of the fistula. The fistula is made somewhat elliptical by incisions which freshen its edges. The integument between the incisions is now thoroughly detached from the corpus spongiosum, commencing at the fistula. When the incisions have been transverse, the flaps are also well dissected up laterally, so that the edges of the fistula may be approximated laterally without causing tension of the edges after they are united. The advantage claimed for transverse over lateral incisions is that, if urine escape from the urethra, it may more readily find its way out without detaching much of the flap. The flaps approximated laterally are united by the twisted suture at once, or may be left to granulate and brought together by pins, after a few days, for the purpose of getting secondary adhesion.

By this operation two raw, flat surfaces are brought together laterally instead of two thin edges. A soft catheter of moderate size should be introduced four or five times daily, but on no account should a catheter be tied in, as this is more likely to defeat than to further the object for which it is used, as shown by Thompson.[2] For although a catheter, when first introduced, may fill the urethra, yet soon it begins to act by "continuous dilatation," and the urethra becomes larger. Then capilary action begins between the wall of the urethra and the outside of the catheter, and a little urine is sucked up, necessarily wetting every portion of the urethral wall and coming into contact with the wound.

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[1] "Die Operative Chirurgie," Leipsic, 1845.

[2] *Op. cit.*

Regarding the success to be expected in operating upon fistulæ with loss of substance, it may be stated, as a general rule, that, the farther they lie from the neck of the bladder, the more difficult are they to close. In the perinæum the natural thickness of the tissues is of great advantage. If an attempt is made to close a very large fistula anterior to the perinæum by a plastic operation, it would always be advisable to follow the suggestions of Ségalas and Ricord,[1] namely, to open the urethra through the perinæum, as the first step of the operation, and allow the urine all to flow by that route, or to pass a catheter into the bladder through some preëxisting fistula in the perinæum. The advantages of such a course are obvious.

SUMMARY OF TREATMENT OF STRICTURE.

1. Alkalies, diluents, and rest, are serviceable in most cases of stricture—sometimes indispensable if there be any serious complication.

2. All uncomplicated strictures, not highly irritable or resilient, should be treated by dilatation with soft instruments up to No. 9, conical steel sounds afterward; reintroductions being made every fourth to eighth day—the older the stricture the longer the interval as a rule, and intervals of one week being most serviceable in the majority of cases.

3. All strictures at or near the meatus must be cut.

4. Resilient, very irritable, and, as a rule, traumatic strictures are best treated by divulsion, if they lie below four and one-half inches from the meatus, otherwise by internal urethrotomy. When a resilient stricture cannot be divulsed, it should be cut—internally.

5. Impassable stricture may usually be overcome—where there is no retention—by time, patience, and skill, with whalebone bougies. If finally proved impassable, the treatment is external perineal urethrotomy.

6. Retention is treated by hot baths, ether, opium, tincture of the sesquichloride of iron; failing these, by puncture above the pubis with the aspirator or through the rectum to gain time; or by external perineal urethrotomy without a guide.

7. For stricture complicated by abscess, infiltration, or many and large fistulæ and for extensive traumatic stricture, external perineal urethrotomy.

8. For infiltration, free incisions, stimulants, supportives, with thorough external division of the stricture.

9. For fistula with loss of substance, local cauterization, lace suture, or plastic operation. Where there is no loss of substance, complete dilatation of the stricture is soon followed by closure of the fistula

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[1] Monthyon Prize of French Academy, 1841.

URETHRAL CASE OF INSTRUMENTS.

It is advisable to introduce here a list of such instruments as will be necessary to make up a case suitable to meet the requirements of such maladies, demanding instrumentation within the urethra, as are ordinarily encountered by the general practitioner:

Gauge.
Conical steel sounds, Nos. 9 to 20, inclusive.
One long and two short whalebone filiform guides.
Thompson's probe-pointed catheter, modified by Otis.
One silver catheter, short curve, size No. 12.
Two silver catheters, with long prostatic curve, sizes No. 10 and 16.
Thompson's divulsor, tunneled.
Civiale's concealed bistoury.
Civiale's urethrotome.
Gouley's catheter-staff, size No. 10.
Urethral forceps.
Cupped sound, size No. 12.
Four English yellow elastic catheters, assorted.
Conical (not olivary) soft bougies, sizes Nos. 1 to 12, inclusive.[1]
Half-dozen different-sized olivary French catheters.[1]
Four Mercier's elbowed catheters, assorted.[1]
Bulbous bougies, sizes Nos. 3 to 20, inclusive.[1]

CHAPTER IX.

DISEASES OF THE PROSTATE.

Anatomy.—Function.—Deformities.—Injuries.—Atrophy.—Hypertrophy.—Bar at the Neck of the Bladder.—Symptoms and Results of Hypertrophy.—Course of Symptoms from commencing Irritability up to Retention, Atony, Stone, Uræmia, Death.

ANATOMY.—The prostate (προστάτης, *standing before*), somewhat improperly called a gland, is a body composed mainly of unstriped muscle, placed like a sphincter around the first inch of the urethra and the neck of the bladder. It contains multilobular mucous glands in its substance, and is tunneled by the two ejaculatory ducts—the common canal formed by the union of the duct of the seminal vesicle with the vas deferens on either side. The ejaculatory ducts open, in the floor of the prostatic urethra, on the sides of the little crest in the median line called veru montanum. Here, also, most of the ducts of the mucous glands of the prostate open. The latter secrete a bluish mucus, which serves to dilute the semen. Both the glands and their ducts, in late adult life, habitually contain certain small solid deposits, called prostatic concretions, formed in concentric layers, which seem to have no special significance, though they often exist in vast numbers, and of considerable size. They are occasionally encountered in the urine. The lower part of the prostate is surrounded by a few striped muscular fibres—the external vesical sphincter of Henle.

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[1] These instruments should not be kept in the general case, as they are liable to soften and stick together in warm weather.

The prostate is a muscle. Its main function is to contract on the semen after the latter has collected within and distended the prostatic sinus. This contraction is coincident with the venereal orgasm. It is spasmodic in character, throwing out the seminal fluid in successive jets. The seat of the venereal orgasm is in the nerves of the mucous membrane lining the prostatic sinus, as proved by the fact that it is sometimes excited by the passage of a sound through the prostate, and is not destroyed by amputation of the glans penis.

The prostatic utricle, the analogue of the cavity of the uterus, is a little depression lying in the floor of the prostate beneath the veru montanum, opening by a small vertical slit in front of the summit of the latter. This cavity and the orifices of the mucous follicles, dilated by hydrostatic pressure in cases of tight stricture, are apt to catch the fine points of filiform bougies introduced through a stricture.

The base of the prostate embraces the neck of the bladder, and surrounds the vasa deferentia and necks of the seminal vesicles. The prostate lies below and directly in front of the neck of the bladder, inclosed by a fibrous capsule, in relation with the pubes in front, the rectum behind, and held in place mainly by the pelvic fascia—or posterior layer of the triangular ligament—and the pubio-prostatic ligament in front. There is never any fat between the rectum and prostate. A large plexus of veins surrounds the prostate in front, and above as well as (partly) below.

The prostate is composed of two lateral lobes, and only two. They form one symmetrical body, and never continue distinct in man, as they do in some animals. Thompson,[1] quoting Morgagni, Santorini, Hunter, Cruveilhier, and others, as well as concluding from his own minute investigations, decides absolutely against the existence of any third or median lobe in the healthy prostate.

In shape and size the organ resembles an Italian chestnut. Its weight is about half an ounce. It lies with its apex looking forward, and may be readily felt during life through the rectum. The finger can always reach above its posterior border, unless the organ is decidedly enlarged.

The prostate is a genital, not a urinary organ. Like the rest of the genital apparatus, it is small before puberty, and becomes notably developed during that epoch. Its average diameters in the healthy adult[1] are, longitudinal 25 to 30 millimetres, transverse 32 to 40, thickness 20–25; or, roughly, 1¼, 1½, ¾ inch. *The urethra usually tunnels its upper part, but occasionally its lower portion, in which case it is only slightly* separated from the rectum, a circumstance which exposes the latter to injury in the cutting operation for stone. The prostatic urethra is surrounded by a small amount of erectile tissue.

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[1] "The Enlarged Prostate."

The arteries of the prostate come from the vesical and middle hemorrhoidal. Its veins discharge into the surrounding venous plexus, which is made up by their union with the dorsal veins of the penis and the veins of the bladder. The lymphatics communicate with the lymphatic glands on the sides of the pelvis. The nerves come from the hypogastric plexus.

DEFORMITIES OF THE PROSTATE.

Deformities of the prostate are exceedingly rare. Its roof is open in extrophy of the bladder, but its floor never seems to fail. It is never wanting except in connection with extensive lack of development of the whole genital system, particularly with non-development of the testicles. After complete castration on both sides, the prostate has been seen to disappear.[2]

INJURIES OF THE PROSTATE.

The prostate by its position is well protected from ordinary casualties, and rarely suffers unless the general injury is very extensive, in which case its implication may be considered unimportant.

The wounds of the prostate are incised wounds made in the operation for stone, lacerated wounds in the same operation from introducing dilating instruments, or extracting a large, rough stone, and penetrating wounds (false passage) made by accident or design in trying to pass a metallic instrument of an improper curve through an obstructed urethra. The prostate is a patient organ, and bears all these injuries well. Healing after stone-operations is exceptionally rapid, and the prostate may be punctured by a catheter without necessarily any evil consequence, unless it be the seat of chronic disease. Injuries to the prostate get well, usually, if let alone, even where abscess forms in the organ, and abscess is not frequent even after pretty extensive laceration, although the parts are constantly bathed in urine. Injuries of the prostate do not excite much constitutional derangement. Very different, however, is the case if the injury extends beyond the limit of the fibrous capsule of the gland. In such cases the worst complications are to be feared (pelvic infiltration, abscess, peritonitis), and if the patient escape with his life he is fortunate. These consequences are more apt to occur in the operation for extraction of very large stone. The only treatment consists in seeing that the urine is thoroughly drained off, and supporting the patient's strength, keeping him at rest, and using opium as required.

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[1] Cruveilhier, *op. cit.*, p. 395.

[2] Civiale, quoted by Pitha, *op. cit.*, p. 727

ATROPHY OF THE PROSTATE.

Atrophy of the prostate is rare, but is occasionally encountered. Among the recognized causes may be mentioned the atrophy of old age, coinciding with general atrophy of the rest of the body. Here the glandular rather than the muscular constituent disappears. Thompson, in his admirable monograph, which obtained the Jacksonian prize, in 1860,[1] has, by laborious investigation, established the fact that the prostate does not necessarily enlarge with age, nor does it necessarily atrophy. As a rule, it continues about of normal size, but it may occasionally atrophy, physiologically, like other structures in old age, just as it may, and often does (pathologically) hypertrophy. Atrophy of the prostate, during general wasting disease, especially phthisis, has been noted. Pressure from a tumor, or cyst, or stone, within or near the prostate, may cause its atrophy, as may also the constant pressure of urine behind a tight stricture. Atrophy, after double castration, is possible.

Atrophy of the prostate has no symptoms except, possibly, lack of force in the ejection of semen. It is an unimportant affection, and has no direct treatment. If the cause can be discovered and removed (pressure), the tendency to atrophy may be overcome.

HYPERTROPHY OF THE PROSTATE.

The morbid condition to which the prostate is most liable is hypertrophy, either general, partial, or by the development of circumscribed tumors. In general hypertrophy the glandular elements, instead of being hypertrophied, often become atrophied by the excessive growth of fibrous and muscular tissue between them. In marked cases they are completely destroyed, and the prostate is converted into a homogeneous fibro-muscular tumor. The isolated, circumscribed prostatic tumors, however, always show new formation of gland-tissue.[2]

Cause.—The cause of hypertrophy of the prostate is totally unknown. The numerous hypotheses which have been advanced by authors need not be discussed: they do not cover the ground. No known diathesis, or combination of circumstances, can account for the affection. It is not venous stasis, or excessive use of the organ, or sedentary life. All that can be said is, that the disease does not occur before middle age—rarely before fifty; Thompson says fifty-five.

Hypertrophy of the prostate, although a disease incident to old age, is not caused by old age. Thompson's minute and laborious investigations[1] have demonstrated that prostatic hypertrophy is pathological, and not a physiological condition attaching to advanced life. The majority of prostates of old men, taken at random, will be normal in size; a few, perhaps five per cent., will be atrophied, while many will be found hypertrophied.

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[1] "On the Diseases of the Prostate," 4th ed., 1878.

[2] Rindfleisch, "Path. Histology," Amer. trans., p. 546.

The prostate is analogous to the uterus in the female in regard to the nature of the muscular tissue which composes it, and this analogy is further borne out by the tendency of both organs to develop fibrous tumors (so called) after middle life. Velpeau[2] suggested this analogy, and justly. The portion of prostatic tissue which hypertrophies is the muscular and not the glandular (or only to a small extent), and although general or partial enlargements of the prostate are the rule, yet it is rather rare for any considerable hypertrophy of the organ to be found without the coexistence of one or more circumscribed tumors, which correspond to the circumscribed fibrous tumors of the uterus, also composed mainly of unstriped muscle. Bayle says that twenty per cent. of women, after thirty-five, have fibrous tumors of the uterus, the cause, of course, unknown. Thompson[3] says that thirty per cent. of males, after fifty, have fibrous tumors of the prostate. He states that moderate enlargement of the prostate may be expected in one out of three men; after fifty, marked enlargement in one out of every eight, but rarely before sixty. Thompson believes that the affection rarely commences after seventy. He quotes, from Beith,[4] the case of an old man who died at one hundred and three, where the only abnormal conditions found were hypertrophy of the prostate and a sacculated bladder.

Size and Shape.—No positive limit in size can be named. The prostate may be encountered of the size of a man's fist. Thompson has seen the transverse diameter exceed four and a half inches. The weight of twelve ounces has been reached. This excessive amount of enlargement, however, is rare—a prostate as large as a small orange being infrequent.

The mass may take any shape, depending upon the part of the organ involved. Smooth and round in general hypertrophy, it becomes more or less irregular in unsymmetrical overgrowth, or from circumscribed tumors.

The portion most frequently involved, either alone or (usually) associated with more or less general hypertrophy, is the posterior median part, known since Sir Everard Home[5] as the third lobe. This nomenclature, however, is inexact. The prostate has no third lobe, and what Home, from his dissection of diseased prostates, named the "third lobe," is, in reality, a pathological formation, and is now more correctly styled median centric hypertrophy. It consists of that triangular part of the prostate lying between the ejaculatory ducts, and overgrowth in this situation is believed to be due to the absence of capsule here. It may be found with little or no enlargement elsewhere. In form it is usually an oval, rounded tumor (there may be two or more), which grows up from the floor of the back part of the prostatic urethra and juts out posteriorly into the cavity of the bladder. It may reach the size of a small pear, and indeed resemble a pear in shape, showing a tendency to pedunculation.

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[1] *Op. cit.*

[2] "Leçons Orales," vol. iii., Paris, 1841, p. 478.

[3] *Op. cit.*

[4] "Trans. Path. Soc.," 1850–'51, p. 124.

[5] "Philosophical Transactions," 1806, paper viii. It was not discovered by Home. It was accurately described by Santorini in 1739, and mentioned by Morgagni.

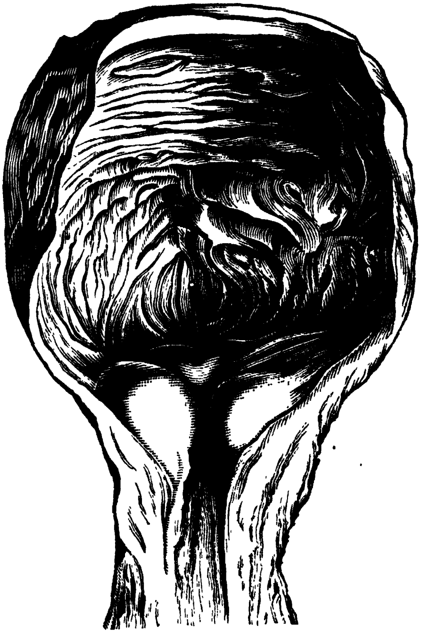

FIG. 57.—(*Coulson.*)
Showing Enlarged Prostate with "Third Lobe," through the Base of which a False Passage has been made.

When hypertrophy invades the lateral lobes, only one may be affected, but usually both, more or less general enlargement corresponding with the local overgrowth (Fig. 57). Under these circumstances the pyriform central tumor tends to fill up the internal orifice of the urethra, leaving a passage on either side along its floor, for the urine. The mucous membrane on either side of the central mass is often drawn up, between it and the hypertrophied lateral lobes, forming a crescentic bar at the neck of the bladder.

Embedded in the hypertrophied mass, it is usual to find several small circumscribed tumors, dense, hard, seemingly fibrous in character, easily enucleated and elastic, so that, when cut through in a clean section of the organ, the cut surface of the tumor overrides the general smooth plane of the incision, as if the little mass had previously been compressed. They are formed of unstriped muscle with some new glandular tissue, and are considered analogous to mammary glandular tumors, or to the glandular bodies which develop (pathologically) in and around the thyroid. These tumors, usually small, may become as large as a marble; many are found of the size of a pea.

Other localized hypertrophies of the prostate are more rarely encountered in the shape of distinctly pedunculated tumors, which grow from any portion of the posterior margin of the prostate, and hang into the cavity of the bladder. They may surround the neck of the bladder like a fringe. Median centric hypertrophy may take this form, constituting a sort of ball-and-socket valve at the neck of the bladder. Finally, there may develop in the thickness of the bladder-walls small supernumerary outlying prostatic glandular tumors, varying in number and in size, but only existing coincidently with one of the ordinary forms of overgrowth.

BAR AT THE NECK OF THE BLADDER.

This affection has become classical since the investigations of Guthrie,[1] who described the muscular bar formed by hypertrophy of bladder-tissue just behind the prostate, and the bar of mucous membrane already alluded to. All the varieties of bar, of which there are three, may be considered at once, in connection with prostatic hypertrophy:

1. Centric median hypertrophy, where a transverse bar of hypertrophied tissue is formed, instead of the usual oval tumor; this form is rare.
2. The lifting up of a fold of mucous membrane between unsymmetrical lateral lobes, or between the so-called third lobe and hypertrophied lateral lobes.
3. The form of bar to which Guthrie specially called attention.

This latter may (rarely) exist without prostatic hypertrophy. Its seat is in the muscular fibres which run transversely across the trigone, behind the prostate. These fibres sometimes hypertrophy greatly, the trigone becomes contracted laterally, the orifices of the ureters approach each other, while the hypertrophied bands of fibres stand out like a bar, forming an obstruction, but an obstruction totally unconnected with any prostatic overgrowth.

Symptoms and Result of Enlarged Prostate.—Hypertrophy of the prostate (like stricture) does harm mechanically, and provokes lesions in other parts. Its symptoms, pure and simple, are unimportant, and do not call for treatment, unless the enlargement be sufficient to obstruct the free outflow of urine, and occasion disease of the bladder (cystitis and its consequences). A description of the special variety of the latter, due to prostatic hypertrophy, finds its place here more naturally than under the head of Diseases of the Bladder.

The immediate result of hypertrophy of the prostate is a deviation in the direction, and usually a diminution in the size, of the prostatic urethra. As the prostate enlarges, its antero-posterior diameter elongates, and with it the length of the prostatic urethra necessarily increases. Thompson has seen it three inches long. The urethra, moreover, tends to become a vertical slit, as its calibre is encroached upon from side to side by the increased size of the lateral lobes. If isolated fibrous tumors grow up from the floor or sides of the prostatic urethra, the course of the latter becomes by so much the more devious. When one lateral lobe is hypertrophied alone, or to a greater degree than its fellow, the urethra is pushed toward the opposite side. When there is posterior median hypertrophy (as occurs in the majority of cases applying for treatment), we have the greatest degree of obliteration of the canal for the least amount of overgrowth. Most cases of prostatic hypertrophy probably never come under the surgeon's notice, in consequence of there being no obstruction to the outflow of urine. Many an old man goes to his grave with enlarged prostate, the existence of which has never been suspected. Of those cases which are seen, median hypertrophy exists in a large proportion. This median central part of the prostate lies at the neck of the bladder directly in the vesical orifice of the urethra (Fig. 58). As it grows upward and backward, it fills the mouth of the bladder, and converts its naturally rounded orifice into a crescentic slit, convexity upward. The floor of the prostatic urethra is also unnaturally tilted up, to override this bulk-head which has sprung up in its course. Fig. 59 shows the effect upon the course of the urethra of this so-called third lobe, and suggests at once the two great facts which are the key-notes to a correct understanding of the pathology of hypertrophied prostate, and of the means of relieving its most prominent symptom—retention. These facts are—

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[1] "On the Anatomy and Diseases of the Urinary and Sexual Organs," 1836.

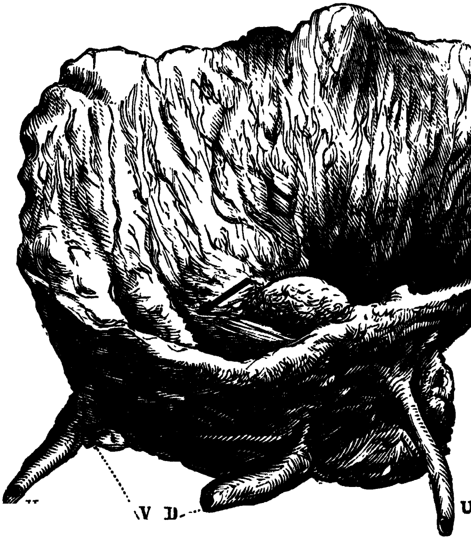

FIG. 58.

1. That such a growth occupying the vesical orifice, and jutting out behind and above it, must obstruct the free outflow of the urine from the bladder.

2. That an instrument of ordinary curve, introduced from without, must strike against this obstacle, and refuse to enter the bladder.

Consequently, a modification in the shape of the instrument is called for.

The bar at the neck of the bladder constitutes an obstruction of the same sort. If several posterior tumors exist, instead of one, the vesical orifice is correspondingly modified. If a single pediculated tumor grow anywhere around the margin of the urethral outlet hanging into the cavity of the bladder, it may act like a ball-and-socket valve, causing retention where there is very little general hypertrophy.

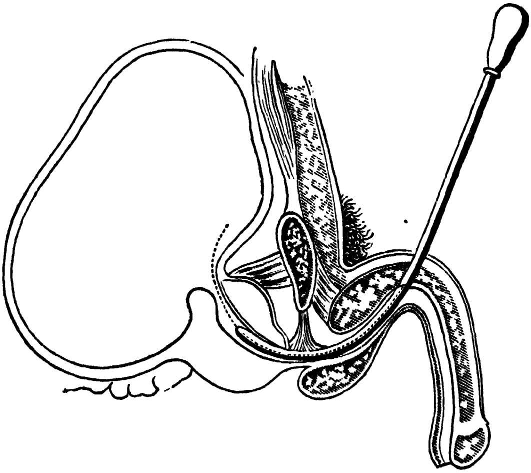

FIG. 59.—Posterior Median Hypertrophy.

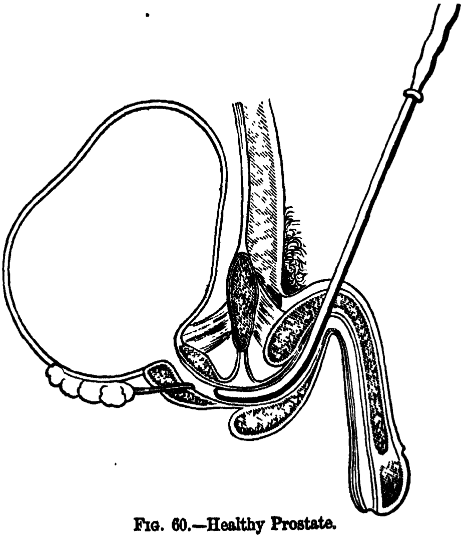

FIG. 60.—Healthy Prostate.

To follow pathologically the natural history of hypertrophy of the prostate, it must be borne in mind that the blood, returning through the vesical veins, finds its way back into the general circulation through the venous plexus lying around the prostate; consequently any enlargement of the latter tends to press upon this plexus, and by so much to obstruct the venous circulation, and establish a constantly-increasing venous congestion of the bladder walls and membranes. Then, again, the deviation in the course of the prostatic urethra, and its decrease in size, mainly due to posterior central enlargement, obstruct the free outflow of the urine, and call for constantly-increasing efforts on the part of the bladder to force out its contents.

From these two circumstances, venous congestion and the need for an exercise of greater muscular power, the bladder walls go on to hypertrophy. The bundles of fibres of the detrusor urinæ increase in size, and jut out into the cavity of the bladder, like the columnæ carneæ of the heart. But these thickened bundles of muscular tissue do not proportionally increase the expulsive power of the bladder, for they are constantly congested, and working at a disadvantage. The muscular fibres of the base of the bladder are not able to contract sufficiently to bring the floor of the viscus above the level of the dam at its mouth, and hence a little urine is left behind after each act of micturition. This residuum (as it is called) announces itself by no symptom, and is unnoticed. It becomes mingled with fresh supplies of urine coming down the ureters, and is partialy passed off and replaced by fresher fluid. After a time, however, the mucus, from the slightly congested membrane around the base of the bladder, being in part retained in the residuum, acts upon the latter, setting up decomposition of urea and liberation of carbonate of ammonia.

The carbonate of ammonia irritates the mucous membrane of the bladder, increases its congestion, and calls forth a new supply of mucus, which, in its turn, acts as a fresh ferment, alkalinizing and decomposing more urine. The natural acidity of the urine still further tends to keep up and aggravate the already-existing congestion. Under these circumstances—the membrane becoming hyperæmic, and thickened around the already-contracted mouth of the urethra—more obstruction to the outflow of urine is occasioned, and the quantity of residuum is increased, while the laboring detrusor urinæ is forced into still greater hypertrophy in its fruitless efforts to overcome the increasing obstacle. In this way the bladder becomes gradually distended, the amount of residual urine increasing from month to month, and the bladder getting less and less able to empty itself. Hence with hypertrophy of the bladder-walls there is, usually, also dilatation of its cavity.

Finally, retention comes on, most often excited by a chilling of the legs, the "cold" which the patient has taken "settling," as it were (where the circulation is already weakened), upon the prostate and neck of the bladder, and superadding an active inflammatory congestion to the already-existing enlargement—this congestion (as in the case of stricture) being sufficient to shut up the urethra completely. The new hyperæmia may subside in a few hours, if the patient keeps quiet in a warm place, and with its disappearance the power of voiding urine returns; or surgical relief may be afforded, or the accumulation may go on to over-distention, and, finally, overflow. This stretching of the hypertrophied but weak fibres of the detrusor takes away more or less of their power of contraction, and the bladder is apt to be left in a condition of atony.

After a retention, if it has not lasted too long, the bladder may go on expelling the excess of urine above the residuum, just as it did before, but now the amount of residual urine is greater, and the power of the bladder less. The congested membrane around the vesical neck and in the prostatic urethra is kept irritated by the partly-decomposed urine, and it takes but a slight cause, a chilling or an excess at table, to bring on another retention. After each attack the bladder is left in a more helpless condition.

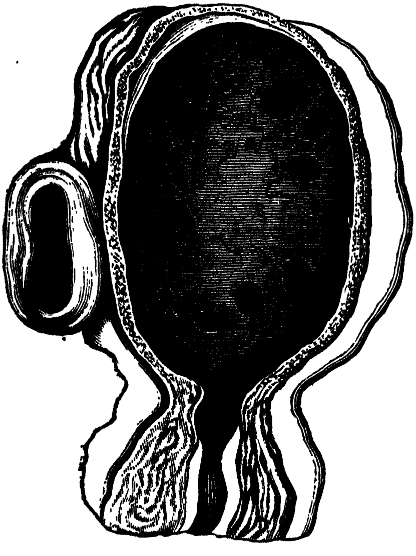

FIG. 61.—(*Crosse.*)

Besides distention of the bladder with hypertrophy of its walls, sacculi may be developed and grow greatly with each succeeding retention. The efforts which the hypertrophied fibres of the detrusor are obliged to make, to expel the urine, cause the mucous membrane to be pressed out between their meshes into little pouches, and if retention come on, these parts, being weaker than the rest of the bladder, suffer most, and may become enlarged into supernumerary bladders composed of mucous membrane, connective tissue, and peritonæum, but covered by no muscular coat (Fig. 61). Sometimes, though rarely, one of these sacculi may be found larger than the bladder itself—usually they are only shallow depressions between the raised bundles of muscular fibres, occasionally little sacs with constricted necks. These sacs have no muscular tissue, and consequently no power of emptying themselves; hence the urine tends to stagnate in them, and to undergo decomposition, depositing crystals of triple phosphate with more or less amorphous phosphate, etc., all of which become glued together by mucus, and thus form a nucleus for stone, which, increasing in size, may finally fill up the sacculus even with its narrow neck (encysted calculus). These changes are all the more certain, if some kidney-stone lodge in a sacculus, instead of passing off. Any foreign body remaining in the bladder becomes incrusted by urinary salts and becomes a nucleus for stone, as is well seen when a catheter is tied in for a length of time.

This process of stone formation, which goes on so readily in a sacculus, also takes place in the bladder when its floor is depressed behind a third lobe, in what is known as the "bas fond," or lower bottom. Here, too, the urine stagnates and deposits its salts, as crystals and amorphous dust, to be glued together upon a nucleus (kidney-stone), or, as is more usual, to become themselves consolidated by the cement of mucoid pus. In all cases of enlarged prostate, where there has been any considerable amount of residuum, stone is liable to form. *Stone is the logical sequence of obstruction to urinary outflow.*

A stone, or several, may exist under these circumstances without giving rise to any symptom. They are usually smooth, and do not scratch or irritate the floor of the bladder greatly, nor do they add much to the already existing pain. The fibres of the weakened detrusor cannot, during micturition, force a stone thus formed against the sensitive tissues at the neck of the bladder and produce the striking symptoms which characterize vesical calculus, when found in a healthy subject.

Enlarged prostate, by obstructing the free outflow of urine and damming up the bladder, tends to distend the cavity of the latter, gradually to dilate and congest the ureters and pelves of the kidneys, and ultimately to excite and maintain a mild inflammation of the cortical and medullary structure of the kidneys—which exists, as a rule, in all old cases. This kidney complication is easily aggravated by any increase in the bladder congestion; and any inflammation of the latter organ is apt to run rapidly up the ureters and further congest the kidneys, bringing on symptoms of mild uræmia, with more or less fever, hot, dry skin, loss of appetite, and a particularly dry mouth and tongue.

In these cases there is no suppression of urine, but on the contrary a marked polyuria, as a rule, occasionally attended by a trace of sugar, and usually showing an occasional cast, a little more albumen than the pus and blood in the specimen will account for, and a sp. gr. of about 1006 to 1016.

Swelled testicle sometimes accompanies one of these exacerbations of inflammation, but more usually follows the introduction of an instrument. The pressure of the enlarged prostate occasions also congestion of the hemorrhoidal vessels, while the violent straining not infrequently brings on some prolapse of the rectum. The distress attending this group of morbid changes is often so excessive that the patient's life becomes a burden to him.

The urine is that of catarrh of the bladder, and this catarrh, the inevitable accompaniment of prostatic enlargement at some period of its existence, is usually limited to the vicinity of the neck. Its tendency is to involve more and more of the mucous lining of the body of the organ, from the action of such causes as cold, over-acid urine, retention, etc. The urine is alkaline, or, even if faintly acid, it has an ammoniacal odor, and often a fetid, sickening smell, which occasionally disappears. When the urine is acid, it is so because it comes down strongly acid from the kidneys, and all of its acidity has not been neutralized by mingling with the alkaline residuum. Whatever urine has been alkalinized, deposits crystalline and amorphous phosphates, so that, even in those cases where the urine is still acid, it is murky, cloudy, filled with little strings and clots and clouds of pus, and with gouts of ropy muco-pus (pus agglutinated and made translucent by ammonia). A few blood-corpuscles will nearly always be found, and more or less amorphous urate or phosphate (perhaps both), with (pretty certainly) crystals of triple phosphate entrapped in the "stringy mucus," and, possibly at the same time, crystals of uric acid, oxalate of lime, or others.

The above detail represents the course of changes as they occur in a majority of instances of enlarged prostate; but there may be variations. Thus the whole prostate may be enormously enlarged without any median posterior hypertrophy, and consequently without any appreciable diminution in the calibre of the urethra or obstruction to the outflow of urine. In these cases there is no residuum. The patient can empty his bladder entirely; but the obstruction to the return of venous blood from the bladder-walls, produced by pressure of the enlarged prostate, keeps up a congestion about the floor and neck of the organ none the less. Hence the symptom, known as irritability (constantly-recurring desire to urinate), is pretty sure to be present, sometimes to an intolerable degree. The bladder hypertrophies, but, instead of dilating, as is the rule, it may contract, and, as there is little or no residuum, sacculi do not form and atony does not come on. This condition of things, unfortunately, may occur even where there is some median hypertrophy and a small, constant residuum, and may even be found occasionally after the bladder has been overstretched by retention.

This is always to be regretted. A bladder that is thoroughly atonied, so that it can only slowly force out the urine through a catheter, is far preferable. Such a bladder is patient and uncomplaining, giving its possessor but little uneasiness. It is slow to take on inflammation, while the other form (where full contractile power remains, and irritability is present) is usually a torment to its owner as well as to the surgeon. The bladder contains little or no residuum, the urine continues acid and only slightly murky in appearance; but the calls to urinate are incessant, night and day, and the bladder cannot be made to contain more than an ounce or two of urine without feeling as if it were splitting. Thompson speaks of an old gentleman whose prostate formed an "enormous tumor" when examined by the rectum, yet repeated explorations failed to find a drop of residual urine. The patient was tormented by an incessant desire to pass water, and experienced great difficulty in the act.

Besides the two conditions already alluded to—namely, dilatation with great tolerance, and contraction with irritability—in the one case the patient urinating rarely, unless there are atony, a large residuum, and overflow; in the other, great frequency of urination being always present—besides these two, there is one other condition, possible but rare, namely, true incontinence. Occasionally, the unsymmetrical development of the prostatic lobes leads to a slightly patulous condition of the internal orifice of the urethra, and causes true incontinence, the patient being unable to prevent a slight, constant dribbling away of the urine. In nine cases out of ten such dribbling is the result of overflow; but still the possibility of true incontinence must be borne in mind. A distinction between the two is easy. Empty the bladder by means of a catheter: if dribbling recur at once, we have incontinence; if only after some hours, overflow.

Course of Symptoms.—During all the time that these pathological changes have been going on, a period of many months, perhaps years, ever since there began to be a little hyperæmia around its neck, the bladder has been getting gradually irritable. The patient does not readily notice it, and will never be able to fix a precise date for the commencement of his troubles. An old man does not sleep soundly or pay the strictest attention to the performance of his habitual functions, and he so gradually acquires the habit of getting up a little earlier than usual in the morning to empty his bladder, that he pays no attention to it. Soon he finds that he wakes up once at night, perhaps twice, with a feeling of fullness in his bladder. He passes water, and goes to sleep again. He is also troubled a little more frequently than usual in the daytime, but he looks upon it as a condition natural to advancing life. He has learned that the little ills of the flesh, if let alone, usually regulate themselves. He has passed water without trouble for fifty or sixty years, and he thinks that he ought still to be able to manage it without applying to his surgeon. He shrinks from acknowledging a weakness, which he must admit to be, if nothing more, a symptom of advancing age, and so he goes on lulled to security, making water at intervals which gradually but steadily become shorter, getting up perhaps every hour at night, and constantly annoyed by a faint, obscure sense of weight and heaviness about the lower part of his belly, with, perhaps, a fullness in the rectum, and a dull pain behind the pubes. The bladder, now, is never empty; but the patient does not know it. Only an excess above a certain residuum can be passed off. The old man notices also, perhaps, that he has to wait a little while before the urine begins to flow, that the stream is small, and is not projected away from him with any force, and that, perhaps, a part of the urine dribbles down perpendicularly from the meatus, while the rest flows as a continuous stream. Possibly he cannot make the "coup de piston," the final spasmodic clearing of the urethra, and finds that a few drops dribble away upon his clothes after each urinary act. He does not experience quite as much ease and relief as usual, after micturition; but this has come on so gradually, that he disregards it. He finds, however, when he is jolted through the streets in a carriage or car, that his calls to urinate are even more frequent than usual.

At this juncture he dines out, and drinks a glass or two of wine more than usual, or he neglects a call to urinate, or gets a wetting, or his feet and legs get chilled (the latter a very common cause of trouble), and suddenly he finds that he cannot pass water at all. After vainly trying at intervals for a number of hours, if he does not seek surgical relief, at last the urine will begin to dribble away from him. The bladder has been distended to its utmost, the mouth of the urethra has been dragged open slightly, and the excess of urine trickles involuntarily away. This is overflow and not incontinence. Meantime the patient has been suffering the torments known only to those who have had retention, and he hails the overflow with delight, believing that his sufferings are about to cease. The hope is vain. The congestion of the bladder neck, brought on by the use of liquor, or by the chilling, and which, added to the already large prostate, has swollen it sufficiently to shut up the urethra entirely, subsides shortly. Gravity, and the contractions of the abdominal muscles, and of the diaphragm, are together able to dispose of a certain excess of urine, which the overstretched bladder, now in a condition of atony, is unable to void. The patient, perhaps, recovers from his overflow, but his residuum is greatly in excess of what it was before his attack of retention, his calls to urinate are more frequent, he is disturbed more often at night. All his former feelings of uneasiness and pain about the hypogastrium and perinæum are increased; digestion is impaired; the appetite fails; and, worn out by loss of sleep, inability to eat, and constant uneasiness amounting to actual pain, the sufferer runs down, aging rapidly, and becoming fretful and irritable, losing all interest in business, and nearly all pleasure in life.

A second and third retention come on, and aggravate the situation. Perhaps a stone is forming, as is always apt to be the case. The bladder may ulcerate, and peri-cystitis ensue, and death finally close the scene, the most common mode of death being by uræmia, induced by a little extra congestion of the secreting portion of the kidneys.

The foregoing clinical history is that of a type case. It may be variously modified, according to the pathological condition of the bladder and prostate; there may never be any retention; on the contrary, there may be constant true incontinence, or the bladder may take on acute inflammation, after an over-distention, with retention, and carry off the patient with acute febrile symptoms. Pyelitis or peri-nephritis may come in as complications, and quickly close the scene, or certainly precipitate the catastrophe.

CHAPTER X.

DISEASES OF THE PROSTATE.

Hypertrophy (continued).—Diagnosis; Description of Instruments and Manœuvres employed in their Use.—Examination of Patient.—Methods of retaining Catheters in the Bladder.—Methods of deciding upon the Character and Extent of Prostatic Deformity as affecting the Course of the Urethra.—Treatment.—Treatment of Complications.—Internal Remedies in Prostatic Disease.—Natural Mode of Death due to Hypertrophied Prostate.

Diagnosis.—When a patient of over fifty comes to seek relief for frequent micturition, suspicion falls at once upon the prostate. It is rare that stricture causes trouble for the first time so late in life; moreover, with enlarged prostate, the inconvenience will, as a rule, have been first noticed at night—the reverse of what is observed in stricture. As the first step in the examination, the patient should be placed upon his back, with the knees elevated and abdomen relaxed, and a digital examination made through the rectum. By this means alone general prostatic hypertrophy can always be demonstrated. In place of the soft, chestnut-like body, hardly recognizable except by the skilled touch, the finger will encounter a rounded, dense mass, smooth and symmetrical, or variously distorted and nodulated. The median fissure between the lobes may be more than usually perceptible, or may be wholly obliterated; while the finger passed up on either side, between the prostate and the walls of the pelvis, recognizes a deepening of the sulcus, and any undue prominence in size of one or the other lobe. Forcing the finger well up the rectum, it may be impossible to hook the last phalanx above the posterior margin of the enlarged prostate, while the seminal vesicles can usually be made out on either side, partly embedded in the general hypertrophy.

Perhaps rectal examination may reveal none of these positive evidences of enlargement, median hypertrophy existing none the less. In such a case the finger readily detects the bladder, if it be distended, beyond the prostate; the latter apparently not at all or but little larger than normal. Pressure through the rectum upon an enlarged prostate does not cause pain, unless there be some inflammation about the neck of the bladder. It often, however, provokes a desire to urinate.

The next step in the examination is to make out the condition of the bladder by palpating and percussing the hypogastrium. Usually this method does not throw any light upon the condition of the prostate, unless it is exceedingly large, when pressure upon it through the rectum may be recognized by the hand upon the hypogastrium. The same occurs in those rare cases of excessive hypertrophy of the bladder-walls with contraction of its cavity (concentric hypertrophy). As a rule, hypogastric palpation only reveals the fact that pressure above the pubes excites a desire to urinate—from transmission of the force to the sensitive neck of the bladder. Sometimes, however, an oval tumor is found, as large as a child's head, filling up the lower part of the belly, perhaps as high as the umbilicus, flat on percussion, and causing a desire to urinate when pressure is made upon it. This tumor, formed by the over-distended bladder, can often be plainly seen, but the patient is usually unconscious of its existence. If the finger in the rectum can reach beyond the posterior border of the prostate, fluctuation can be felt between it and the other hand pressed upon the hypogastrium.

The patient is now asked to stand up and to pass water into a glass vessel. A little gleety discharge may be often found at the meatus, originating from the congested surface of the prostatic urethra. Occasionally, if questioned, the patient will confess that he is troubled with frequent erections, the cause of which lies in this same congestion. Sometimes, on the other hand, erections are absent.

As the urine is flowing off, it will be noticed that it commences tardily, and in a small stream, which gradually enlarges. There is very little force to the flow. There may be two streams, the one projected, and the other dribbling perpendicularly from the meatus, indicating an obstacle at the outlet of the bladder to the escape of urine. If there is retention, the urine will not flow at all, or comes away only by drops. While the stream is flowing, if the patient be requested to strain, instead of becoming larger or flowing with greater force, the stream may be diminished in size and power. Under these circumstances a ball-and-socket arrangement, or some valvular condition of the overgrowth, may be predicated, which, when acted upon by the pressure of the abdominal muscles through the mass of accumulated urine, tends still further to occlude the internal urethral orifice, so that the stream flows fastest when the least effort is made. If the bladder be inflamed, there may be severe tenesmus and pain during the attempt to urinate, and the rectum may protrude or fæces be passed during the act. Hernia may be occasioned by the violent straining. At the end of urination the stream gradually dribbles away into drops, and often the final jet or "coup de piston" is wanting, although the latter may be perfect or even exaggerated.

If the urine which has been voided be now held up to the light, it will be found to be cloudy, troubled, perhaps bloody, badly smelling, and to contain white flocculi of pus, or perhaps gouts of stringy mucopus, or again it may be perfectly clear. The condition of the urine indicates the amount of cystitis present, while its quantity (in residuum) and the force of its flow, after the catheter has been introduced, allow an estimate of the degree of atony. There may be considerable irritability, with little or no cystitis, and in such cases the urine is nearly or quite clear, generally strongly acid, and of high specific gravity. Usually there is more or less pus present, indicating cystitis, and, when the latter is of a high grade, the fluid is often ammoniacal, or has a fetid odor of decomposition, is filled with pus, more or less blood, fluid or in clots, and stringy muco-pus, which is often gritty from containing large quantities of triple-phosphate crystals.

When the patient has voided all the water he can, he is again placed upon his back, and a full-sized silver catheter of short curve passed gently down toward the bladder. The instrument will usually go smoothly along (perhaps halting for a little coaxing at the triangular ligament) until it has reached a depth of from six to eight or more inches, when it will stop. On no account should the least force be employed. A finger is now again introduced into the rectum to feel whether the instrument is in a false passage, which may have been made in some previous attempt at catheterization. If it is found to be in the canal and in the median line, the finger can readily appreciate the approximate increase in thickness of that segment of the prostate lying between the instrument and the rectum; and a diagnosis of obstruction in the floor of the urethra at the neck of the bladder is established.

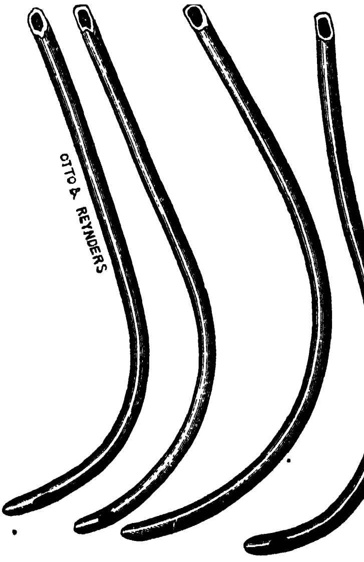

FIG. 62.—(*Thompson.*)

In examining a patient for the first time, it should never be lost sight of that we are dealing with an old man whose urinary passages are in a more or less irritable condition, and probably unused to local disturbance. Any examination which is at all rough or too prolonged is pretty sure to be followed by some aggravation of the symptoms, and, unless the condition be urgent (retention), it is often advisable to make only a partial exploration at the first sitting, leaving the rest for another day. If made worse by his first examination, the old man becomes far less docile for future management. If, however, there is retention with or without overflow, it becomes the surgeon's duty to make judicious use of all available means to enter the bladder with a catheter.

The next step in the examination is, to determine the nature of the obstruction in the urethra, and some instrument must be found which will enter the bladder. Unless the "third lobe" rise very abruptly from the floor of the urethra, the bladder may be entered by a silver catheter with an extra long curve. Such an instrument should be of large size. The surgeon should be provided with several of them of different sizes (from No. 10 to 16), and with varying curves (Fig. 62). One of these instruments will usually slip into the bladder, a flow of urine announcing the success of the operation.

Generally the amount of residual urine is small. The degree of irritability is not proportionate to the amount of urine which cannot be voluntarily passed, indeed it may be greatest where the residuum is at a minimum. It is always a favorable sign for prognosis, as far as the future comfort of the patient is concerned, to find a copious residuum upon the introduction of the catheter. Such cases are always more easily managed than others, provided only the patient can be taught to introduce a catheter for himself, since, by keeping his bladder from overfilling, he can avoid his most disagreeable symptom—continually-recurring desire to urinate. Should the silver instrument fail to enter the bladder, a small conical olivary French catheter, with a slender neck and a long fixed curve in its woven structure, designed to keep its point in contact with roof of the urethra, will sometimes override the obstacle and effect an easy entrance.

Failing in this, Thompson's method may be employed. A medium, smooth, blunt English catheter is selected, its stylet removed, and itself bent into an exaggerated curve, the last inch of the curve being more accentuated than the rest. When the instrument has been shaped (Fig. 63), it is held for a moment in cold water, which causes it to retain the curve it has received until it again becomes warm. The instrument so curved is oiled, and, without a stylet, rapidly introduced, so as to allow the heat of the urethra to act upon it as little as possible. It reaches the floor of the prostatic urethra before the point has lost its exaggerated curve, and this point, following the roof instead of the floor of the canal, readily surmounts any median hypertrophy and passes over the "third lobe" into the bladder. Another excellent method of overriding median hypertrophy with an English catheter is, to introduce the latter armed with a stylet of exaggerated curve. When an obstacle is encountered, the stylet is slightly withdrawn. This manœuvre causes the beak of the catheter to tilt upward sufficiently to surmount the obstruction.

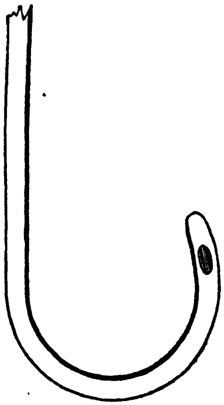
FIG. 63.—(*Thompson.*)

Another instrument devised by French ingenuity, and capable of rendering valuable service, where perhaps no other catheter will pass, is a catheter known by the name of its inventor, Mercier. It is an elbowed instrument, having a fixed angle (Fig. 64, *A*), or two angles (Fig. 64, *B*), in the woven material of which it is constructed. The English now make similar instruments, usually colored brown, sometimes black. They are generally too stiff and their angle is too obtuse; consequently, though more durable, they are not so useful in difficult cases as the black French instrument. This catheter (similar instruments, with one or two angles, are also made of metal) is avowedly constructed to override obstructions in the floor of the urethra, such as posterior median hypertrophy. The point follows the roof of the canal or strikes any obstacle upon its inclined surface, and at an angle which allows the instrument to ride over the obstruction. For difficult cases these catheters are invaluable.

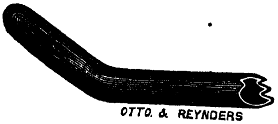

FIG. 64—*A*.

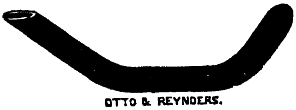

FIG. 64—*B*.

The instruments already described suffice for general enlargement and for cases of "third lobe," but occasionally the canal may be so deviated, by irregular lateral overgrowths, that even these instruments fail to effect an entrance. For such cases there are several instruments left. Phillips's catheter, open at both ends, introduced over a two-foot

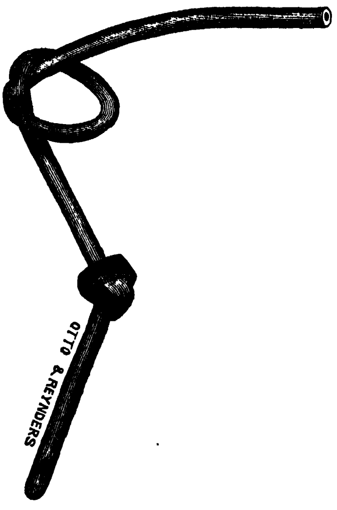

FIG. 65.

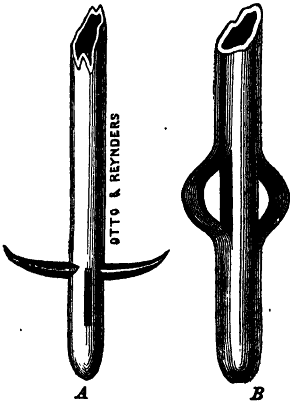

FIG. 66.

guide (p. 104), must not be forgotten. It is capable of rendering important service. Another instrument is a simple soft-rubber catheter, looking like a piece of ordinary rubber tubing, shut at one end, with holes in the side (Fig. 65). This is oiled and introduced without a stylet, like a ramrod into a gun, and will sometimes find out and pass through the sinuous windings of a prostatic urethra where all other instruments fail. Similar instruments are now made in England, colored a dirty pink, known by Thompson's name. They are smoother than the French, more durable, of larger calibre, and easier of introduction. Holt's self-retaining catheter is similar to these instruments, but is provided with two wings (Fig. 66, *A*) of soft rubber near the eye, which do not materially interfere with introduction (in any case where a metallic instrument of long curve will enter), and which wings, once in the bladder, fly out and retain the catheter. Holt's catheter is introduced by the aid of a long stylet. The instrument has been modified as shown in Fig. 66, *B*. All of these instruments of soft rubber may be worn in the bladder for a considerable length of time without (in many cases) producing much uneasiness or becoming incrusted by urinary salts, if the bladder is washed out with warm water pretty regularly. Holt's catheter is sometimes objectionable on account of its wings—which indeed often fail to hold the instrument in—hence, in retaining in the bladder a soft-rubber catheter, one of two other devices may be employed. A tube of any hard material, an inch long, may be pushed over the outside of the catheter or a small one within its calibre, at that point of the shaft which will lie just outside the meatus after the instrument has entered the bladder. Around this a thread may be tightly tied, knotted again, and tied beneath the corona, or fastened one thread on either side under a small piece of adhesive plaster. This method originated with Thompson. The catheter-holder,[1] however, is the most convenient apparatus for retaining any instrument in the urethra. It is simply a sort of muzzle for the penis, made of flat bands of soft rubber. Where the bands cross over the meatus they are perforated by a minute hole. This being very elastic, admits and firmly holds any instrument passed through it, while the strap of the muzzle surrounds the body of the penis (Fig. 67).

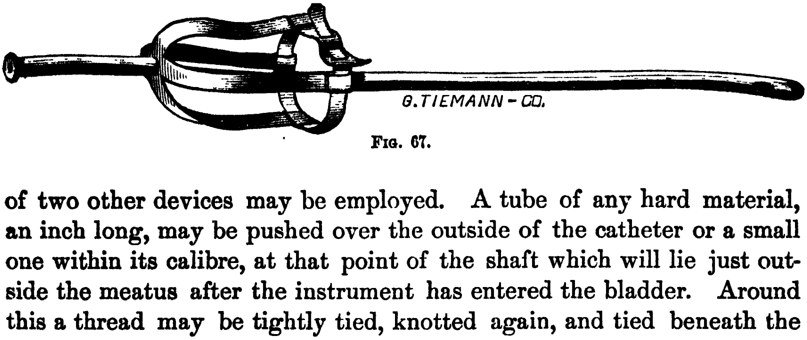

FIG. 67.

American ingenuity has supplied a metallic instrument to follow the sinuous curves of a distorted prostatic urethra. It was devised by Squire, of Elmira, and consists of a straight silver tube, terminated by

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[1] It is of French origin.

silver segments of small size, not united together, but held in contact by a little flexible chain, running through the hollow of the catheter, and attached firmly to the last segment, which contains the eye (Fig. 68). The central chain terminates in a wire which appears at the mouth of the catheter in the shape of a screw, furnished with a circular nut. By loosening the nut and pushing down the wire, all the segments making up the end of the instrument fall apart; by tightening it they are stiffened up and brought into place, being left in a condition more or less flexible, according to the tension of the central chain. This instrument, pushed down into a tortuous canal, is capable of assuming any curve, and following the windings of the passage. It has proved serviceable in some cases. The objection to it is, the temptation to employ force in its manipulation.

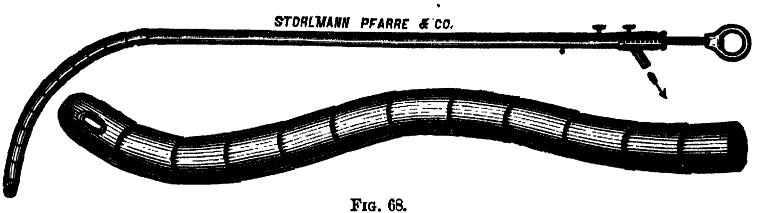

FIG. 68.

Another ingenious instrument of Mercier's may be useful. It is designed to avoid false passages. A silver tube, of long curve, is furnished with a central woven catheter, which may be protruded and pushed on through an aperture in the concavity of the instrument near its point (Fig. 69). The solid beak of the instrument enters the false passage, the soft catheter is protruded, and passes onward in the urethra into the bladder.

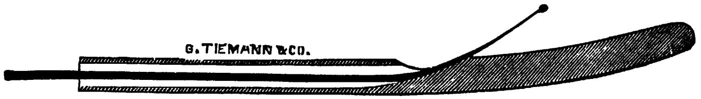

FIG. 69.

Methods of estimating the Size and Character of Prostatic Overgrowth.—It is sometimes desirable, for accuracy of diagnosis, or other object, to get an approximate idea of the exact situation and size of the overgrowth, together with the direction and amount of the deviation of the prostatic urethra, perhaps for purposes of rough comparison from time to time, to decide what advance is being made by the disease. A good deal of information, in a general way, may be gained on these points. In introducing the silver catheter of long curve, if the prostatic urethra be deviated to the right or left by the undue development of either lobe, the point of the instrument will be correspondingly deviated, and the degree may be roughly estimated by noticing the movements communicated to the handle. The increase in the antero-posterior diameter of the prostate may be rudely calculated with the same instrument, by noticing the depth to which the eye has to penetrate before it finds water—instead of seven or eight inches, perhaps ten, eleven, or more. In studying out the form of overgrowth at the neck of the bladder, all the information necessary may be obtained with a short-beaked, solid sound of the curve known as Leroy d'Etiolles's, or Mercier's, or with the similarly shaped metallic instrument known as Thompson's stone-searcher (Fig. 70), the advantage of the latter being that it is a catheter as well as a searcher, and that, after the introduction, the bladder may be emptied, injected full or distended to any desired extent, so as to facilitate examination, all of this without removing the instrument. The bladder should always contain a few ounces of fluid when this instrument is used. There is rarely any difficulty in introducing it through an enlarged prostate. Like Mercier's catheter, it is peculiarly adapted to glide over obstructions in the floor of the urethra, and this is the variety of obstruction which exists most frequently, and which most often opposes an obstacle to the entrance of rigid instruments, or those of ordinary curve.

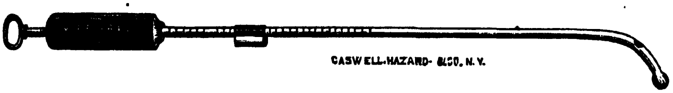

FIG. 70.

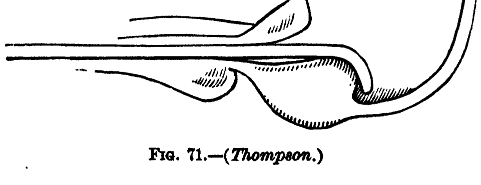

FIG. 71.—(*Thompson.*)

In examining an old case of atonied bladder, with enlarged prostate, for stone (and this examination should always be made whether there are symptoms of stone or not), Thompson's searcher is the best instrument to use, and during the search the condition of the internal orifice of the urethra should be examined. In introducing the instrument, if it is necessary to depress the handle greatly, in order to get through the last part of the prostatic urethra, it is because the beak of the searcher must rise gradually over a posterior median enlargement. If the beak seems to strike abruptly against a bulkhead, and on a little manipulation, perhaps, to slip, with a start, suddenly into the bladder, the obstruction is probably a bar. When the beak is in the bladder, it is retracted until it hooks the upper margin of the urethral orifice. The shaft is now held nearly horizontally and the instrument rotated. (The bladder must contain a few ounces of fluid.) If the prostate be healthy, or the obstruction a bar, this rotation can be performed without sensibly altering the direction of the shaft of the instrument. If there be a tumor jutting out anywhere from the prostate (posterior, median, or other enlargement), the beak becomes arrested, and the direction of the handle has to be changed in order to make it override the obstacle. Such deviation will give the approximate position and size of the outgrowth. Finally, in withdrawing the instrument, if the prostate be healthy, it may be retracted easily with the beak downward, while it will hook against any posterior median enlargement (Fig. 71). With the searcher the hypertrophied trabeculæ of muscular tissue of the bladder may be also recognized, and their size and number roughly estimated.

Treatment.—In the present state of our knowledge, hypertrophy of the prostate is not curable by any means that have yet been used—by iodine, bromine, electricity, or pressure. The advocates of these and other methods have failed to establish their claims. Inflammatory increase in size may be successfully combated, hypertrophic apparently not. But still a vast deal of comfort may be afforded to patients; they can always be greatly relieved, sometimes cured, that is, freed from every subjective symptom. It is only necessary to remember that hypertrophy of the prostate is a mechanical malady obstructive in its character, in order to appreciate at once the great object and end of treatment, namely, to overcome by art the obstruction erected by Nature to the free outflow of urine. The catheter is the natural specific for enlarged prostate, just as the steel sound is for stricture of the urethra. The catheter is no novelty in surgery. A need for its use has been recognized for ages, probably in just these cases of old men with enlarged prostate. Very good specimens of lead, copper, and bronze catheters (of long curve) have been found among the ruins of Pompeii. But, to be effective, the use of the catheter must be intelligent, and other means must assist its employment, while, in very rare instances where there is no residual urine, it is of little or no service.

To take up one of the most common class of cases first, where, after a few months or perhaps years of gradually increasing inconvenience, a surgeon is finally applied to. Here the patient will complain, perhaps, that he passes too much water, that he is disturbed at night, has certain obscure pains or uneasy feelings in the perinæum or rectum, and is a little feverish, with a warm, dry skin and a very dry tongue and mouth, which, he says, depends upon the fact that he is "bilious." He is confident that he empties his bladder at every act of urination, and says that the difficulty is, that his bladder has become too small, that it will only contain a little urine, and then calls for relief. Here the amount of residuum is probably large, and the bladder often perceptible in the hypogastrium, to the eye as well as the hand. The patient may have suffered from one or more attacks of retention, which possibly came to a spontaneous end.

In such a case, after due examination, and when the patient has passed all the urine he can, voluntarily, he may be placed with his back against the wall, a small (No. 7–9) French olivary catheter, with a slight curve woven in its texture, oiled and given to him, without a stylet, and he may be directed to insert it into his urethra, and to push it slowly down the canal. In a majority of instances, this somewhat theatrical procedure is brilliantly successful, and the patient is unable to refrain from expressions of extravagant surprise to see a pint or more of urine flow out of a bladder which he supposes he has just emptied.

This point gained, the patient becomes at once docile and manageable. There is no feature about the treatment of so much importance, or any more difficult to accomplish, in many cases, than this one of overcoming the natural repugnance of an old man to pass an instrument into his bladder. If he is made to do it for the first time, and the operation is made light of, if he succeeds he is so charmed by the result, and his pleasant feelings afterward, that the victory over his symptoms is half gained. If he fails, and his failure is laughed at, he is all the more eager to try again, with another instrument. There is little or no danger in passing a catheter upon an old man in the erect position, for the first time. They do not faint when the instrument is traversing the prostatic urethra. This accident is to be feared only in young men, whose sexual tracts are always liable to be in a more or less hyperæsthetic condition.

In drawing off residual urine, for the first time, whether the patient is suffering from retention or not, if the quantity is large (over a quart), it should never be all drawn off at once. At any time during its escape, if there is complaint of the least faintness, the catheter should be at once withdrawn, and the patient placed upon his back, with the head low. Cases are on record where death has followed at once upon the sudden withdrawal of all the urine from an habitually over-distended bladder, and, where this result does not ensue, the patient is exposed to the danger of a subacute grade of cystitis, attacking the mucous lining of the body of the bladder, from the sudden and complete removal of tension upon its walls, which had been kept up pretty constantly for months, perhaps years, by an habitual over-distention with urine. The first and main step in the treatment of any bladder-disease affecting an old man is, to get his entire confidence and coöperation, otherwise he will often frustrate the best-directed efforts, by errors of omission, if not of commission. Another essential point is, that the patient should be able to empty his own bladder at will. He has lost the power of doing this in the natural way, and, unless he learns to do it by art, he is never safe. The repugnance which old men have to commencing the use of a catheter is extreme, and the main difficulty is often to get them started.

If they make the start in the manner above narrated, not knowing what they are doing, or what they are doing it for, the surprise at their success, the ease with which it was accomplished, together with the feeling of relief experienced afterward, will be the strongest arguments which can be presented of the efficacy of continuing the use of the instrument. If the patient fail to introduce the instrument, the surgeon must find one that will enter, but the patient must sooner or later learn to pass an instrument for himself. A metallic catheter should not be used by the patient, if any of the soft varieties can be made to pass. With a soft instrument, without a stylet, it is difficult for an old man to do himself any considerable injury—with a silver instrument it is very easy. There are cases, however, where a silver instrument, with a special curve, may be absolutely necessary.

The patient having acquired the ability to introduce an instrument for himself, is now instructed in urethral hygiene and given some gentle laxative, if necessary—a little infusion of pulvis sennæ co., or some confection of sennæ at night, together with a mild alkali, such as the citrate of potash (gr. x–xxx) three times daily. He is directed to cover himself with merino in summer and flannel in winter. His feet and ankles must be especially well protected with suitable woolen stockings. The feet lie farthest from the heart, the source of heat. From their pendent position, the venous blood has great natural difficulties in getting out of them. They are that part of the body most easily chilled, yet habitually they are the least well protected, especially by old men. A knowledge of these facts indicates the natural means of remedying the evil. An ordinary case requires no change in diet. Exercise should be taken at will, but not on horseback, or of a kind attended by much jolting, as this tends mechanically to increase the congestion about the base and neck of the bladder, and leads to an aggravation of the symptoms (irritability). The catheter should be used by the patient more or less often, according to the quantity of residuum, normal intervals of urination being observed as nearly as possible.

In ordinarily mild cases, where the frequency of urination comes on mainly at night, emptying the bladder once thoroughly just before retiring may be all that is required. After this, the patient will sleep quietly until toward morning, when the residuum will have re-collected, and then the desire to pass water will again return. Where the residuum is large, a pint or more, it is far better for the patient to rely entirely upon the use of the catheter, introducing it three or four times daily, perhaps five or six, and never attempting to pass a drop of urine without its aid. This becomes necessary where there is a valvular condition of the vesical orifice, or such other deformity as makes it impossible for the patient to pass any water. Here, if the catheter enters easily, the patient is perfectly safe. He goes around carrying his instrument with him. He becomes proud of his ability to introduce it, and does it better than any one can do it for him, with an apparent recklessness from habit which is sometimes almost painful to witness. Patients sometimes go on in this way for ten or twenty years, never passing a drop of urine except through the catheter. Such patients usually state that their condition is an enviable one. Their atony may be so complete that they never feel any desire to urinate. They pass the catheter at stated intervals with regularity, and are never uneasy when they are obliged to remain in company for a length of time.

These cases are fortunate ones. There is no irritability, the bladder is capable of large distention, and is very patient and uncomplaining. With them no medicine, except possibly an alkali, is of the least service. There is a mechanical obstacle to the flow of urine, and this is mechanically relieved. All that is necessary is for the patient to keep his bladder clean, by injections of warm water, once or twice daily, to prevent the formation of stone, or the lighting up of inflammation by the decomposing urine, and to keep himself supplied with catheters.

The question now naturally arises, Is it advisable to instruct a patient with enlarged prostate in the use of the catheter, if he has a very small amount of residuum or none at all? Most assuredly, Yes. If there is no residuum, still, with the slow advance of the disease, a time is pretty sure to come when there will be a certain quantity, or when, from the effect of cold, irritating urine, or other cause, retention may come on. It is a rule with no exceptions, that a patient with hypertrophied prostate is never safe unless he can pass a catheter for himself, any more than is a patient with hernia who does not wear a truss. Hence, in all cases, the patient should be taught the use of a soft catheter, be provided with an instrument, and instructed in the manipulation of washing out the bladder, both for purposes of cleanliness and so as to be enabled to employ medicated injections. If the amount of residuum is small, so that no material relief is afforded by the mere draining off of the urine which the patient cannot pass, still the force of the above reasoning is applicable, and the utility of washing out the bladder is equally necessary, since the liability to the formation of stone exists as well where the residuum is small as where it is large.

If no instrument can be made to enter the bladder, and there is retention, the aspirator should be used twice daily above the pubis for a time, meanwhile attempts being made to reach the bladder with the catheter. If all efforts finally fail, a permanent opening must be established above the pubes (p. 130).

The washing out of an hypertrophied and dilated bladder, where the mucous membrane is habitually congested, and secreting an over-supply of mucus, is a point of treatment of cardinal importance. By this means the last drops of residual urine, with the pus and stringy mucus which they contain, are diluted and drained away, and no ferment is left behind to decompose the healthy fluid as it comes down the ureters. The formation of stone is prevented, and the congestion existing around the neck of the bladder is soothed and kept from any aggravation which would increase the irritability—that distressing symptom so closely linked with the pathological changes incident to enlarged prostate. The best method of washing out the bladder is as follows: The soft catheter through which the residuum has been drawn off is used. A double-current catheter is not advisable, for with such an instrument no distention is brought to bear upon the bladder-walls, and the whole mucous surface is not brought into contact with the cleansing fluid. Warm water should be used, since it is soothing as well as cleansing, and does not excite the bladder to speedy contraction upon being thrown into its cavity. A temperature of about blood-heat should be aimed at—a little below 100° Fahr. The best style of syringe is a rubber bag holding about four ounces, provided with a metallic nozzle tapering to a fine point (Fig. 72), so that it may readily enter the calibre of any catheter, and with a stop-cock which works smoothly for convenience of manipulation. An ordinary syringe is not advisable, since it is more difficult to keep in good working order, harder to employ with one hand, and because the patient is apt to communicate the shock of driving the piston home, through the catheter, to the neck of the bladder, already congested and sensitive.

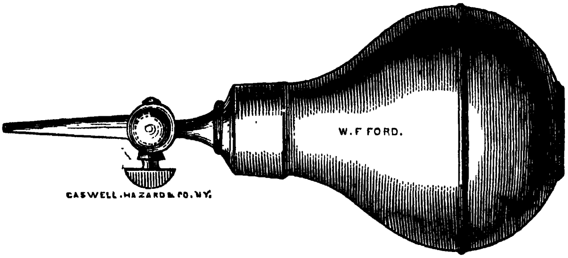

FIG. 72.

The bag is filled by exhausting the air, and inverting it into the vessel containing the water. By removing the nozzle from the water and slightly compressing the bag, with the nozzle held uppermost, whatever air remained within it will be first expelled, and then the water will jet out. Now the stop-cock is to be turned, and the nozzle once more submerged, the stop-cock being again turned on. The bag will now fill itself completely, and there is a certainty of no air being present in it. Finally, the stop-cock is turned off, the nozzle being still under water, and the bag is ready for use. At this stage of the operation the patient (or surgeon) introduces his soft catheter, and drains off the residual urine. As soon as the last drops have been evacuated, the nozzle of the bag is gently inserted into the catheter and the stop-cock once more turned on, while gentle, continued pressure with the hand is applied to the bag, forcing its contents in a steady stream into the vesical cavity. As soon as a slight feeling of distention is experienced by the patient, the bag is removed, and the injected fluid allowed to drain off. A second washing is executed if necessary in the same manner, and perhaps a third, until the water which flows out is nearly or quite clean, the bag being refilled if necessary. These simple manipulations are easily learned by a patient, and often constitute the only treatment which his case requires. The washing is performed once or twice daily for the remainder of the patient's life, or more frequently if the secretion of pus by the congested mucous surface is abundant.

At the commencement of treatment in many cases where the irritation of using the catheter keeps up or increases the mild cystitis already existing, and causes a free and continued secretion of pus, it is advisable to pass from simple water to the use of medicated fluids in injection. These may be first employed by the surgeon, afterward intrusted to the patient. Nothing better can be suggested than the formulæ already advocated by Thompson—acetate of lead, from one-sixth to one-third of a grain to the ounce of water, or one to two minims of dilute nitric acid to the ounce.

For a continuous soothing injection—one which has power to allay irritation and check the pus-formation—the following combination of Thompson is excellent:

℞. Sodæ biborat., ℥j.
Aquæ,
Glycerini, āā ʒij.
M. S. One tablespoonful to a four-ounce injection.

Chlorate of potass is also serviceable, in the strength of from five to fifteen grains to the ounce. Silicate of soda is at present vaunted by the French, in the strength of one per cent., to arrest pus-formation.

These injections are sufficient for all cases. Nitrate of silver of any strength is difficult to use, and rarely of any service. Carbolic acid does not yield good results.

In certain very rare instances it may be deemed advisable to tie in a catheter (p. 190). None but a soft instrument should be so employed, preferably one of pure caoutchouc, as they will remain longest in the bladder without becoming incrusted with urinary salts. Cases requiring the tying in of a catheter are those in which introduction is exceedingly difficult, and the patient lives at a distance from the surgeon, or where the neck of the bladder is very tolerant of an instrument, and it is desired to prevent the irritation of frequent reintroduction, and the spasm of the muscles of the bladder and perinæum, which such reintroduction occasions. Wherever an instrument is left tied in, whether the patient is walking about or on his back, the cavity of the viscus should be thoroughly washed out with warm water several times daily, and the instrument removed if it appears to be causing irritation. Sometimes a caoutchouc instrument may be worn for months, and removed still clean, if the bladder has been syringed out regularly.

In those rare cases where there is real incontinence (not overflow), where the patient is constantly leaking slightly, either continuously or by little jets, caused by involuntary spasmodic muscular contractions, or, finally, in any case where the patient's calls recur at short intervals, and the nature of his occupations is such that he is not sure of always being able to reach quickly a place where he can relieve himself, he should constantly wear a urinal.

Of the many varieties of this instrument found in the shops, only one accomplishes the two necessary objects of being safe as well as comfortable. The urinal referred to (Fig. 73) was devised by a private gentleman of this city, suffering from true incontinence. He was accustomed to dine out frequently, and related with enthusiasm the satisfaction he experienced, when conversing in the evening with a lady guest, to feel the urine trickle down his thigh, with the conviction that it was going to the right place, and could not disgrace him.

The construction of this urinal is most simple. It is made of white rubber, in the form of a large pouch, capable of receiving the whole scrotum as well as the penis, and large enough to allow a free circulation of air around the parts; thus preventing sweating or excoriation. From this pouch two broad bands of rubber extend up flatwise, one over the belly, the other over the nates to the waist, where they are attached by buttons to the suspenders. Below, the pouch terminates in a long, flat bag, attached by tapes to the thigh and leg, and reaching nearly to the ankle, so that no urine collecting in it can possibly spill out during any ordinary motion. A metallic cap at the bottom unscrews to drain off the urine, and clean the instrument, which should be washed out daily with a mild solution of permanganate of potash.

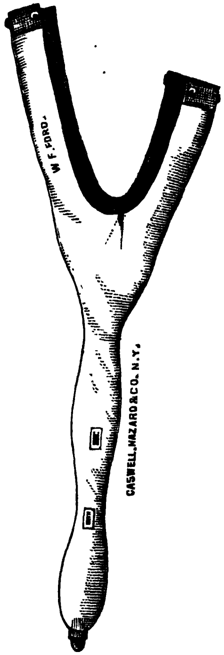

Fig. 78.

Treatment of Complications.—During the use of the catheter, one or both testicles may swell. This is not a matter of serious importance, and may be overcome by the treatment for epididymitis. If the pain is severe, or if position alone relieves the pain, as it usually will do, there is no necessity for any thing further; introduction of the catheter may be continued, and the swelling will subside.

What is liable, however, to give most trouble early in the treatment by repeated catheterization is, the congested condition of the neck of the bladder. In most cases, especially where retention has come on, this congestion is considerable, and is readily aggravated, the slight violence done in catheterism lighting up a little cystitis about the neck, or increasing what already existed. *Cystitis* announces itself by increased uneasiness when the bladder contains only a slight amount of urine, tendency to spasmodic contraction of the bladder-walls, unless they are atonied, increased amount of pus in the urine, and, almost always, by the presence of blood in greater or less quantities. This amount of cystitis is most apt to come on during treatment of a bladder already somewhat irritable, where there is not much atony, or after retention. Old cases, where the organ has been over-distended by a very large residuum for years, are not liable to suffer much from the introduction of the catheter, provided the bladder is judiciously (not too suddenly) emptied. When cystitis of the neck comes on, calls to urinate will become more and more frequent, the last part of the urine drawn through the catheter will be tinged with blood, perhaps blood will continue to flow into the bladder after the withdrawal of the catheter, so that the next urine passed or drawn will resemble pure blood, or may be nearly as black as ink, if it has been retained for some time; or, again, if blood flows freely and quickly into an empty bladder, it may fill it to a certain extent, clotting into a solid mass in its cavity.

None of these conditions need cause alarm. If the flow of blood is excessive, and the bladder has power to empty itself, it is expedient to intermit the use of the catheter for a time, otherwise it must be continued, employing the utmost gentleness of manipulation. Unless cystitis of the neck becomes a prominent complication, the bleeding, on the use of the catheter, will cease in a few days, and then the patient may be allowed to get out of bed and gradually to resume his ordinary habits of life, relying on warm-water injections to keep the bladder clean and the residuum from decomposing. When the flow of blood and irritation around the vesical neck are considerable, opium, in suppository, is advisable for a few days. If the bladder becomes filled by a clot, no attempts to break it up or dislodge it are admissible. It will gradually soften, dissolve, and come away in the urine, which should be kept abundant and alkaline.

In the great majority of cases the above treatment will cover the ground, and afford all the relief the patient can hope to find, general hygiene being regulated, exposure to cold particularly avoided, the urine kept from becoming too acid, and the patient being made his own physician. Some patients cannot get along without the occasional insertion of an anodyne suppository, but the use of such means of relief should never be placed in his hands unless he is made fully aware of the danger of abusing his power. In some cases, after retention, the bladder will gradually reacquire its contractile power, and the amount of residuum will be lessened, but this is rare. The atonied, over-stretched bladder of an old man does not recover its tone like that of a youth, and indeed it is better that it should not. The patient should be encouraged to rely entirely upon his instrument, and not to strain to use his bladder. Where considerable prostatic obstruction exists, happy is the man whose bladder resembles a passive sac, never fretting at the presence of urine, no matter in how great quantity. Here the patient uses his catheter regularly, at stated intervals during the day, washes out his bladder, and is in a condition to be envied by ordinary mortals, provided only he can keep himself supplied with catheters which will pass. Such patients are in the habit of picturing to themselves what would happen in case they suddenly found themselves unable to pass any catheter, and it is, indeed, their wont to select some surgeon near whom they live, and to keep themselves constantly informed of his movements, so that they may not be left in the lurch when in need of aid, if the time should come.

Some cystitis almost invariably exists, in a greater or less degree, before the patient applies for treatment, and it is, in fact, often for relief from the symptoms caused by it that he so applies. The cystitis gives rise to his frequent calls to urinate, and supplies the pus and stringy mucus with which his urine abounds. A mild degree of cystitis will subside spontaneously, as a rule, under the improved condition of the bladder produced by draining off its residuum and washing out its cavity. If this should prove inefficient, medicated injections may be used as already described, when detailing the manœuvres of injection (p. 198). The temperature of the injection should still be about blood-heat.

A medicated injection should not be thrown into the bladder until its cavity has been washed out. Then from one to two ounces may be injected, retained a moment, and allowed slowly to drain away. This may be repeated from one to three times daily. It is useless to inject anodynes into the bladder, as their action is uncertain.

Internal Remedies in Cases of Hypertrophy.—When the cystitis seems to be getting unmanageable, when the calls to urinate are frequent and painful, or, in any case, when the amount of pain is considerable, it is better to use an anodyne suppository, which may best consist of codeine (gr. j–ij), watery extract of opium (gr. ss–ij), or morphine (gr. ⅙–j). Camphor is occasionally added to these suppositories for the purpose of obtaining more effect with the employment of less opiate, or, more often, extract of belladonna, with the alleged object of allaying spasm. The efficacy of both these latter agents is overrated. The object is to allay pain, and pain only justifies us in using opiates. The frequency of calls to urinate may be great, but, if there is not pain as well, there is no indication for anodynes. The amount used should be barely sufficient to control the pain, and should be subdivided into many small doses (four to six in the twenty-four hours), rather than given all at once, or even night and morning. Laudanum or other fluid may be used instead of solid suppositories. The reason why anodynes are of no service by injection into the bladder is, that only a small amount is absorbed, unless the solution injected be concentrated, while the bladder epithelium is entire; but, should an abrasion or ulcer exist, the amount absorbed may be very considerable, producing more effect than was desired. Atropine or belladonna, in sufficient doses, will lengthen the intervals of urination, and modify pain; but the agent is in many cases uncertain in its action and difficult to manage—in some cases it acts well. One twenty-fifth of a grain of sulphate of atropine in water is a proper dose to commence with, increasing gradually until an effect is obtained, and watching the patient for symptoms of poisoning.

When cystitis, accompanying enlarged prostate, becomes considerable, enough to require the use of anodynes, the recumbent position should be insisted upon. The patient should lie upon his back with a hair pillow under the hips, so that they may be raised higher than his shoulders, in this way relieving the bladder from some of the intestinal pressure, and favoring a drainage of venous blood from the pelvis. The head may be raised, but the shoulders must be low. The skin of the hypogastrium should be kept slightly reddened by the application of a hot, light poultice, containing a sprinkling of mustard, or more neatly by the use of moistened mustard-paper, and a flat rubber bag, containing hot water, which may be laid upon it. Heat, applied also to the perinæum, is agreeable to the patient. To meet the demand of heating

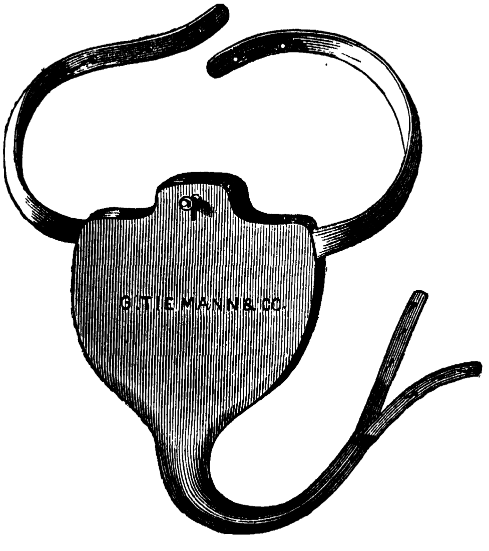
G. TIEMANN & CO.

FIG. 74.

the perinæum and hypogastrium at once, there has been constructed a rubber bag with a long, hollow prolongation to pass between the thighs (Fig. 74), the whole to be fastened on by suitable straps, and to be filled with hot water. These bags afford great comfort. The rectum should be kept empty by the daily use of a hot enema. Water, as warm as can be borne in the rectum, often exercises a decidedly soothing effect upon the inflamed bladder.

The only internal remedies which seem to be of much service are the different alkaline diuretics and diluents. Of the former, citrate of potash, in gr. xx–xxx doses, three or four times daily, according to the concentration and acidity of the urine, is perhaps the best. It may be alternated with bicarbonate of soda, acetate of potash, or liquor potassæ. The alkali may be given in carbonated water, flaxseed-tea, or in whatever diluent is selected. The variety of this latter class of remedies is innumerable. All of them are doubtless of value, but none possess specific qualities. They should be taken largely. The one perhaps most generally useful as well as agreeable is ordinary flaxseed-tea flavored with lemon-peel (lemon-juice is to be avoided) and sugar, and taken cold or warm, to the extent of from one to three pints in the twenty-four hours. Buchu, so popular in this country, may be combined with it in infusion, from three to six ounces daily. Thompson speaks well of a decoction of the underground stem of the *Triticum repens*,[1] made by boiling two ounces of the root for a quarter of an hour in a pint of water. This is strained, and the whole taken in four doses during twenty-four hours. If the patient tire of one decoction or infusion, it may be changed for another—pareira brava, uva ursi, etc.

The old combination of hyoscyamus and liquor potassæ, chemically incompatible, is clinically often of decided service. The old form of prescription made with the tincture is not so useful, on account, possibly of the alcohol it contains, as the same made from the extract of henbane. The following formula has proved quite efficient in moderating frequent and painful micturition:

℞. Liq. potassæ, ʒ ij – ℥ ss.
Extr. hyoscyami, ℈j – ℈iv.
Syr. aurant. cort., } or, Mist. acaciæ,
Aquæ cinnam., aa ℥ iij. } Aquæ, aa ℥ iij.
M. S. A tablespoonful in some diluent every eight hours.

As has already been several times stated, the urine coming from the kidneys, in these cases of bladder-disease depending upon obstruction to the free outflow of urine, is nearly always acid, over-acid indeed, becoming alkalinized in the bladder, and the object of giving alkalies by the mouth is to render the urine less irritating to the sensitive lining membrane of the bladder. Hence the impossibility, and indeed the inappropriateness, of endeavoring to render the urine acid by administering acids.

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[1] "Diseases of the Urinary Organs."

By the employment of the above means, aided by a large share of patience, the washings of the bladder being regularly and gently attended to, cases of vesical catarrh depending on prostatic obstruction will gradually get well up to a certain point, not incompatible with the exercise of all his functions by the patient, and, provided only he attend scrupulously to keeping his bladder clean by warm-water injections, leaving him capable of enjoying a life as long, as comfortable, and as useful, as if his bladder were sound. This statement, of course, does not apply if either of the three complications, so common with this *form of disease, exists: namely, stone, mild pyelitis, or fatty atrophy of the kidneys. Where stone is present, it must be removed.* There are cases, however, where a stone of considerable size existing in an old man may cause but little irritation, and, where such calculus cannot be dealt with by lithotrity, it may be unwise to subject the patient to the risks of lithotomy. If stone be not present, the use of daily washings will prevent its formation.

Mode of Death in Cases of Hypertrophy.—The not very infrequent complication of a low grade of inflammation of the ureters and pelves of the kidneys is always a serious matter. This becomes easily aggravated by cold or imprudence in diet, developing at once symptoms of mild uræmia, with hot, dry skin, loss of appetite, sleeplessness, great restlessness, dry, red, or pasty tongue, parched mouth, tendency to depression, headache, tendency to wandering of the intellect, constipation—all this attended, as a rule, by polyuria, a little albumen and a few pale casts in the urine. A fatal termination of these symptoms is a not uncommon mode of death in cases of prostatic disease. The complication is best treated by confining the patient to bed, in a room where the air can be frequently renewed, and the temperature kept high, at 80° Fahr. or thereabouts; exciting the action of the skin and bowels; giving diluents in abundance, and a mild (milk) diet. The combination of potash and hyoscyamus acts well upon these cases, and some mild stimulant is not only admissible, but necessary to keep up the general strength, until kidney congestion has subsided. These evils are more easily avoided than cured.

CHAPTER XI.

DISEASES OF THE PROSTATE.

Congestion.—Parenchymatous Prostatitis.—Terminations: in Resolution, Chronic Prostatitis, Abscess.—Treatment.—Gonorrhœal Prostatitis.—Prostatic and Peri-prostatic Abscess.—Treatment of all Forms of Abscess.—Follicular Prostatitis.—Its Liability to be mistaken for Stone in the Bladder.—Treatment.—Tubercular Prostatitis.—Cancer of the Prostate.—Prostatic Concretions.—Prostatic Calculi.—Neuralgia of the Prostatic Urethra.—Syphilis of the Prostate.

Congestion of the prostate occurs physiologically during venereal excitement. If such excitement be unduly prolonged without being gratified, even sometimes without erection, if the imagination be given up to erotic fancies, the mucous follicles of the organ secrete more or less of a peculiar, viscid, bluish mucus, without odor, which, mixed with urethral mucus, finds its way out at the meatus. This phenomenon is perfectly natural. Physiologically it is analogous to the watering of the mouth of a hungry individual, at the sight, smell, or even thought of food. Many individuals, however, whose sexual requirements are not met, live in such a state of mental inquietude, particularly in regard to the genito-urinary organs, that this drop of mucus appearing during erection excites in their minds the most lively alarm, and they hasten to their surgeon to demand his aid for spermatorrhœa, stating that they never have an erection without the involuntary emission of seminal fluid.

Of this idea it is often hard to dispossess the patient's mind, but an honest explanation of the whole subject will rarely fail to convince him; while the observance of purity of thought and the avoidance of occasions of sexual excitement, or, better still, marriage, to place him in natural sexual relations, will prove, infallibly, effective of cure.

If this physiological hyperæmia be kept up for a long time (several hours), the prostate is liable to remain congested, throbbing slightly, feeling full and hot, giving rise, perhaps, to frequent calls to urinate, and attended by a very slight gleety discharge. If the patient urinate frequently, straining to empty the bladder of its last drops, the prostatic congestion is maintained and aggravated. All these uncomfortable feelings, due to prostatic congestion, are relieved by rest; more quickly by a cold sitz-bath, or by a very hot sitz-bath of short duration. The desire to urinate produced by the contact of water should not be yielded to.

Slight congestion of the prostate frequently complicates gonorrhœa, stricture, etc. It is usually ephemeral in character, announcing itself only by a little increased frequency of urination, or it may continue on to actual inflammation. Congestion may be excited in the prostate by sexual excess, masturbation, etc., and this, being kept up and often repeated, may lead to chronic follicular prostatitis, without passing through any acute stage. The hyperæmia attending hypertrophied prostate has been already considered.

PROSTATITIS.

Inflammation of the prostate is of two kinds:

1. Parenchymatous. 2. Follicular.

1. Parenchymatous Prostatitis.—Spontaneous (primary) inflammation of the prostate is rare; inflammation, traumatic, or extending to the prostate from contiguous parts, is not uncommon.

Causes.—Among the causes of prostatitis may be enumerated gonorrhœa, stricture, extreme and prolonged sexual excitement, concentrated acid urine, cold, violence from instruments, stone fragments, etc.; chemical irritants, strong injections, cantharides internally, etc. Gonorrhœal inflammation, after the first week, may run rapidly down the urethra and involve the prostate, particularly if the patient indulge in liquor, sexual intercourse, or take violent exercise, or use strong injections, throwing them deep in the canal. Sometimes, during gonorrhœa, without appreciable exciting cause, the prostate inflames. The inflammation behind a stricture may run back and involve the prostate, in the same way. Sexual hyperæmia, too much prolonged, or too often repeated, may lead to it. Cold, acid urine, violence from instruments, rarely are efficient, except in combination with other causes. The chemical irritants act directly.

Course.—Prostatitis commences as congestion. Passing on to true inflammation, it terminates by resolution, exudation of pus on the free surface, perhaps by croupous exudation; by abscess, or peri-prostatic formation of pus; or, finally, it may linger indefinitely as a chronic (follicular) inflammation, mild in degree, occasionally becoming aggravated.

Symptoms.—The organ swells rapidly, putting the capsule on the stretch, and often reaching the size of a small orange. It may feel square (Vidal), or be unevenly enlarged. The exploring finger in the rectum strikes at once against this mass, which juts into the cavity of the gut, is very tense and hot, and can be felt distinctly to pulsate. It is exceedingly sensitive to pressure—unlike prostratic hypertrophy, which is not sensitive unless inflammation be present. In prostatitis the lightest touch, even the presence alone of the finger in the rectum, at once excites a desire to urinate. Pressure over the pubes brings on the same desire. The patient is conscious of something protruding into the rectum, and may experience an unnatural desire to go to stool. If he endeavor to do this, he strains ineffectively, causing himself pain, but getting no relief, even if he succeed in forcing out a little fecal substance, after suffering great distress in the effort. The perinæum feels hot, and is sensitive to pressure. The subjective sensations, locally, are heat, weight, throbbing. There is a sort of dragging feeling over the lower part of the abdomen, as well as in the penis and scrotum. There may be pain in the back and limbs. If gonorrhœa be the cause, or stricture with profuse gleet, the urethral discharge ceases at once, or becomes very scanty and thin. It returns, however, as the prostatic inflammation subsides. The stream of urine is small and is passed with effort. The prostate may swell to such an extent as to obliterate the prostatic urethra entirely for a time, causing retention. Thompson believes this to be the cause of all retentions which occur during acute gonorrhœa; in fact, of all retentions supposed to be produced by so-called inflammatory stricture.

With this swelling of the prostate is almost invariably associated congestion of the vesical neck, thickening of the membrane at the internal urethral orifice, and a constantly-recurring, never-satisfied desire to urinate. If retention comes on, as it rarely does, this feeling exists as a matter of course; but, even when the bladder is entirely empty, it feels partly filled, there is no sensation of relief after voiding the urine, and, when a few drachms have re-collected, the urgency of the sensation forces the patient to another effort, equally unsatisfactory. The urine causes pain on its passage, but the pain is most severe as the last drops are being expelled, when the circular fibres at the bladder's neck squeeze the tender prostate. It is now that blood is often discharged from the overloaded vessels, coloring the last drops of the stream. A pain like that occurring with stone is experienced, both in the perinæum running down the urethra and, often with greatest intensity, on the under surface of the penis in the urethra, at about three-quarters of an inch from the meatus. Coinciding with all these features which stamp out the disease so plainly that it is impossible to mistake it, there is general febrile disturbance, with usually the utmost concern, apprehension, disquietude, and depression with excitement of mind, such as is rarely caused by inflammations of much greater magnitude and attended by far more severe pain elsewhere. The patient is irritable, despondent, and suspicious; often, in fact, wild to an extent amounting to mild acute mania. He cannot sleep, he will not eat, and it is with difficulty that he can be kept quiet. Fortunately, his feverish condition induces him to drink abundantly.

The inflammation may subside before the malady has reached this point. Resolution may come on at any time, even after the above extreme has been reached; the throbbing pain and heat disappear, and usually a little discharge appears from the prostatic sinus. This discharge may continue for a considerable period (follicular prostatitis), or may rapidly cease while the calls to urinate grow less frequent, and the sensation after the act approaches the full relief felt normally. If the inflammation has extended into the seminal vesicles, there may be spermatozoa in the discharge. A false membrane may form in the prostatic sinus, but this is exceedingly rare. Finally, the inflammation may extend down the vasa deferentia, linger in a chronic form in the seminal vesicles, or pass on to light up epididymitis.

If the inflammation, instead of undergoing resolution or passing to a chronic state, continue, abscess is the result. Resolution usually takes place between the fourth and twelfth day, and recovery is complete in from one to three weeks. Possibly, instead of recovering or continuing as a distinct folliculitis, chronic interstitial inflammation may remain behind, leading to induration and general tumefaction of the gland which may persist for months or years, and may even be described and treated as hypertrophy. This kind of (false) hypertrophy gives good results with pressure, electricity, etc., namely, absorption of the inflammatory product, and thus is excited the vain hope of a similar result where true hypertrophy exists.

Treatment.—No point of treatment is so essential as rest in any congested or inflamed condition of the prostate. Repose, as nearly absolute as possible, may bring about resolution where otherwise suppuration would have ensued. The tripod of safety for a patient with prostatitis is rest in bed, some alkaline diluent for the urine, and enough anodyne to control severe pain and excessive action of the bladder. The rest should be in bed, the patient lying upon his back with the hips raised. The bladder should be restrained from contracting as much as possible, by the exercise of the will, while forcible efforts at emptying the last drops of urine—to which the patient's feelings impel him—should be interdicted. For the same reason cathartics should not be administered. Copious enemata of hot water carefully given are preferable. The jutting out of the tense prostate into the rectum gives the patient a constant idea that the lower bowel is occupied by fæces, and of this notion it is difficult to divest him. He must not be allowed, however, to indulge in straining at stool, as this action aggravates his condition. As for medicine, none is needed in a mild case except plenty of bland fluid—flaxseed-tea, infusion of triticum repens, etc., with some citrate of potash or Vichy water. By these means the irritating properties of the urine are counteracted. The combination of liquor potassæ with extract of hyoscyamus (p. 203) seems to suit certain cases. Watery extract of opium, codeine, or morphine, may be used in suppository, gently introduced, in sufficient quantities to modify the urgent desire to urinate. These means, combined with a light diet, will bring on resolution in a few days in most cases.

GONORRHŒAL PROSTATITIS.—If the prostatic affection comes on during a gonorrhœa, all active treatment of the latter must be abandoned. It is particularly essential to discontinue urethral injections. If the onset of the affection has been especially severe, and the exploring finger detects a prostate unusually tense, throbbing, and painful, early in the attack, leeching of the perinæum may be resorted to. If this is attempted, it should be thorough. From ten to fifteen vigorous leeches should be placed upon the perinæum, and the bleeding be encouraged by the subsequent application of hot water to the bites. Hot fomentations to the perinæum and hypogastrium tend to modify pain. The skin over the hypogastrium should be kept constantly reddened by sprinkling powdered mustard upon the poultice there applied, or, more neatly, by the use of mustard-paper over which is applied a flat rubber bag, containing a thin film of very hot water (Fig. 74). If possible, a general hot bath, or hip-bath (100° Fahr.), should be administered once or twice daily. Sleep may be encouraged at night by full doses of the bromide of potassium, or sodium alone or combined with some bitter syrup (orange-peel), with from gr. v–xx chloral hydrat. Repeated rectal examinations of the prostate are to be avoided, and on no account should any instrument be passed into the bladder unless there is retention. In such a case a small French olivary catheter should be gently used, as seldom as possible consistently with comfort. Failing with the soft instrument, a silver catheter must be employed, with suitable regard to the inflamed and tender condition of the parts. Cases might occur where the aspirator would be preferable to catheterism.

PROSTATIC AND PERI-PROSTATIC ABSCESS.

If pus form during parenchymatous inflammation of the prostate, we have a continuance, in a high degree, of all the symptoms of that inflammation, except that the local throbbing is more considerable and that the pains become less tense and of a more lancinating character. A sharp chill or a series of rigors announces the commencement of suppuration. As the pus forms, it presses upon the already narrowed canal of the urethra, and finally, unless the abscess is very small, obliterates it entirely, bringing on retention. There may be one or more purulent foci, or the whole substance of the prostate contained within the fibrous capsule may fall into suppuration.

These abscesses, left alone, discharge into the urethra, bladder, rectum, or through the perinæum, or may find outlet by two or more of these routes at the same time. They are often tardy in opening spontaneously, on account of the dense nature of the fibrous capsule of the gland. When such an abscess is opened or bursts, all pain and discomfort are relieved as if by magic. Retention disappears, the heat and throbbing cease to be annoying, and a continuous flow of pus is often the only reminder of the terrible torment which the patient has endured. The pus may exceptionally burrow among the tissues of the perinæum, or, still more rarely, into the pelvis, giving rise to local and then general peritonitis. In exceptional cases, where the purulent focus is small, it may never point; but, with subsiding inflammation, the pus may be gradually absorbed, leaving behind a calcareous mass, of a size proportionate to the quantity of pus which it represents. These concretions are not usually discovered till after death. They are rarely of sufficient size to interfere materially with the contractile function of the gland.

After the pus has escaped from a prostatic abscess, if the cavity is small, it usually granulates slowly, fills up, and becomes cicatrized; the rapidity of the process of repair being often interfered with, if not prevented, by a communication of the cavity with the bladder or rectum—or even the urethra, from which urine rugurgitates during every act of micturition. If the cavity of the abscess is very great, if, for example, it involves the whole contents of the fibrous capsule of the prostate, the termination may be fatal. Sometimes a slow repair sets in, but it is rarely if ever perfect. More or less of a cavity is left behind, lined with a new-formed, imperfect mucous membrane, discharging more or less pus, and, as a rule, remaining permanently in fistulous connection with the rectum, urethra, or bladder. In these cases urine may escape by the rectum, and fæces and intestinal gases by the urethra, while the constant condition of irritation of the remnant of prostatic substance involves the neighboring neck of the bladder, giving rise to more or less cystitis, and tormenting the patient by frequent calls to urinate. A small purulent collection in the prostate may empty itself gradually into the urethra by a minute opening, and its existence consequently not be made out.

The prognosis in small abscesses of the prostate is good, but, where the collection of pus is very extensive, the prognosis must be guarded.

Analogous to the above are the *peri-prostatic abscesses* which occasionally come on during the course of gonorrhœa, or in cases of stricture. Here the seat of the purulent collection is found to be in the connective tissue around the prostate. The symptoms are, in the main, those of prostatic abscess; but they are less marked, less intense, and the malady is apt to run a slower course. Œdema, perceptible to the finger in the rectum, is the best distinguishing mark between existing or imminent peri-prostatic collections of matter and abscess within the prostatic capsule. Such collections of pus finally press upon the neck of the bladder and cause retention. They may be easily felt by the exploring finger in the rectum, masking the prostate and jutting into the cavity of the gut. If not opened by the surgeon, they may point spontaneously in any of the directions named for prostatic abscess, and subsequently behave in a similar manner.

Epididymitis, terminating in suppuration, is liable to complicate prostatic abscess. Abscess of the prostate rarely leads to infiltration of urine.

Treatment.—With an abscess, peri-prostatic or prostatic, near the posterior wall, whenever fluctuation can be felt through the rectum, puncture with a trocar should be practised at once, to arrest further destruction of tissue, to relieve suffering, and to prevent retention.

After puncture, such abscesses usually do well under hygienic supportive treatment. Where the abscess bursts spontaneously, the treatment is purely symptomatic. Where the collection is prostatic, and, bulging into the urethra, produces retention, without yielding fluctuation through the rectum, either of the three following courses may be followed, preferably the first: (1.) Pneumatic aspiration of the abscess through the rectum; (2.) The use of the same instrument several times daily above the pubes, to evacuate the urine waiting for the abscess to break; or, (3.) Careful attempts to relieve the bladder with a silver catheter passed through the urethra. The abscess is pretty sure to be broken during attempts at catheterism, and the urine flows freely immediately after the pus.

Where a large cavity in the prostate is left behind by an abscess, it may be washed out daily with a very short-beaked silver catheter, having its eye near the tip, and, after the washing, injected with some astringent solution to stimulate granulation.

For the treatment of rectal fistulæ, *see* p. 164.

After an abscess breaks or is opened, relief is always prompt, and the cure often effected by the unaided efforts of Nature.

Follicular Prostatitis.—In this disease, the mucous surface of the sinus of the prostate and of the mucous follicles and ducts is inflamed, while the parenchyma of the organ for the most part escapes. The affection is familiarly known as *prostatorrhœa.* It can hardly be said to exist in an acute form, so prone is it to run a chronic course. It may come on during gonorrhœa after the inflammation has reached the deeper portions of the urethra, attended at first by symptoms of parenchymatous congestion. The latter soon subside, and the prostatorrhœa alone remains, with (perhaps) some congestion about the vesical neck, and consequent irritability of the bladder. The main feature of the disease is a slight oozing from the meatus, muco-purulent in character. This discharge is apt to be more profuse during the passage of hardened fæces through the rectum at stool. Defecation may be painful. The patient usually believes the discharge to be semen. It does not contain spermatozoa, but is muco-purulent, full of fatty *débris*, leucocytes, epithelium, and often prostatic concretions. This discharge is exceedingly rebellious to treatment.

If, with follicular prostatitis, as is often the case, a certain amount of chronic parenchymatous inflammation coexist, then we have an affection not common but exceedingly obstinate and difficult to manage. It is evidenced by a combination, in a mild degree, of the symptoms of both maladies. A peculiar weight is felt, dragging down toward the perinæum, with painful feelings in the prostate; walking becomes painful; crossing the legs decidedly increases the pain, as does finally the sitting posture, and especially the muscular contractions made in raising the body from the sitting to the standing position, or the reverse.

Added to these are symptoms almost identical with those of stone in the bladder. There is the same frequency of urination, less urgent on some days than on others; the urine contains pus and blood; blood sometimes flows at the end of the stream; pain is felt on urination, both at the neck of the bladder and, especially toward the close of the act, at the end of the penis, along the under surface of the urethra; the patient has a tendency to pull and tickle the prepuce and urethra; the tender prostate, squeezed at the end of urination by the contracting bladder, is the seat of extreme sensibility. The bladder is liable to expel its contents spasmodically. The cut-off muscles of the membranous urethra participate in the general irritability of the part, sometimes interrupting the stream suddenly. As a rule, however, this "cut-off" does not come until near the end of the act of urination, and is a sort of premature *coup de piston.*

With these symptoms the patient is feverish and irritable, unable to get about, as all motion aggravates his symptoms. He chafes under confinement, is perhaps listless and depressed; perhaps has an excellent appetite, and very little constitutional disturbance. In chronic cases the mental depression is a feature of the disease out of all proportion to its gravity. A slight gleety discharge accompanies this condition. It may escape observation, from the fact that the frequent acts of urination wash it away before it has had time to collect sufficiently to show itself at the meatus. The finger in the rectum may find slight enlargement and heat of the prostate, and at times detect extra sensibility. The element of hyperæsthesia of the cut-off muscles often accompanies and outlasts this form of prostatic inflammation, keeping up the symptoms perhaps after the parts have returned to a nearly normal condition. In these cases it is sometimes impossible to decide that there is no stone. Search for stone should be instituted. None will be found, but the prostatic urethra will manifest extraordinary sensibility, and the patient will be much worse after the search than before.

Treatment.—In follicular prostatitis no remedy is so efficacious as repeated mild blistering of the perinæum. It is best applied by painting canthariddeal collodion upon one side of the perinæum, confining the patient for forty-eight hours to bed, and painting the other side of the raphe, as soon as the soreness of the first application begins to subside. This course, aided by alkaline diluents, will usually master the affection in a few weeks. In applying the collodion, great care is necessary to avoid involving the scrotum and anus, as the former drops over the blistered portion, while the serum from the blister runs down over the latter. This is best accomplished by binding the scrotum up tightly, and covering the blistered surface from the start with cold cream and lint, anointing also the anus and scrotum. Where the disease is of particularly obstinate character, and of long duration, the blisters may require to be continued for many weeks. The rectum must be kept unloaded in chronic prostatitis. With blisters should also be combined a supporting diet and tonics. Bumstead speaks highly of drachm-doses of dilute phosphoric acid containing a small amount of strychnine in solution. If the affection prove obstinate, injecting the prostatic sinus with a mild solution of nitrate of silver, five to ten grains, with an appropriate instrument (Figs. 22, 23) may perhaps be of service, or the application of tannin with the cupped sound (Fig. 130).

TUBERCULAR PROSTATITIS.[1]—A form of chronic prostatitis occurs in tubercular, scrofulous, debilitated subjects, the chief feature of which is cheesy degeneration, situated primarily in the ducts and follicles of the organ. True miliary tubercle does not seem to occur in the prostate. It may be that opportunities of observing it have not presented themselves. The cheesy nodule has thus far alone been found. The disease is rare.

The symptoms are those of severe chronic prostatitis. If the cheesy matter be small in extent, and situated around the prostatic sinus only, it cannot be diagnosticated; but if the same deposit abound in the substance of the organ, so that the contour of the latter can be felt to be lumpy from the rectum, or, as is more commonly the case, if the course of one or both vasa deferentia can be traced out as an infiltrated hard tube, joined to a distinctly-enlarged, knobbed, indurated seminal vesicle, then we may safely assert that tubercular prostatitis exists. In such cases one or both epididymes are also usually the seat of so-called tubercular deposit, and there may be tuberculoid foci in the lungs or elsewhere. Tuberculization of the prostate not uncommonly follows similar morbid changes in the kidneys.

The course of tubercular prostatitis is very slow. From time to time the symptoms become spontaneously better or worse, but the general tendency is toward steady aggravation. The cheesy masses ulcerate out, form abscesses which break in all directions, leaving open cavities or fistulæ. Such cavities evince no tendency to heal. Slight hæmorrhage from the urethra from time to time is a pretty constant symptom, but the hæmorrhage is followed by no relief (*see* Case XXXVII.).

Prognosis is bad. Death occurs from the gradual running down of the patient, or from tubercular disease elsewhere; the latter, perhaps, being of the true miliary type. Occasionally recoveries are made under the continued efficient action of hygienic conditions and proper food. The course of the malady is always exceedingly slow.

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[1] The term tubercular disease is retained in this treatise, whether the lesion be miliary tubercle or not. Histological pathologists are still discussing the merits of cheesy degeneration *versus* tubercle. That cheesy degeneration may occur where there has been no tubercle is undoubted; but that, because no miliary granulations are found in a given case, there has been no tubercle is not always so clear. In the testicle, for example, it would seem that cheesy epididymitis is often truly a tubercular neoplasm (Rindfleisch), even where no miliary masses are found. Clinically there is a connection between certain cheesy degenerations and tubercle; and, for the present, it is perhaps better to abide by the classical titles (tubercular prostatitis, tubercular testis, etc.) than to originate others resting upon a foundation not yet clearly defined.

Treatment.—Curative treatment consists of general rather than local means. For local treatment, the same rules apply here as those laid down for chronic follicular prostatitis. The general measures are hygiene, fatty food, tonics, proper clothing, life out-of-doors, traveling, change of climate, anti-strumous medication. These means, intelligently combined, sometimes effect a cure.

CANCER OF THE PROSTATE.

Primary cancer of the prostate is exceedingly rare. More usually it is secondary to advanced malignant disease elsewhere—especially in the kidney or testicle. As to the relative frequency of this disease, Tanchoû,[1] out of 8,289 cases of fatal cancer, sets down only three for the prostate. Scirrhous, melanotic, and medullary disease, have all been noted; the latter most frequently. Cancer occurs chiefly in advanced life, sometimes as a complication of already existing hypertrophy, and doubtless some of these cases have not been recognized. Medullary cancer, as a primary affection, has been observed in the prostate of young children. Pitha saw one fatal case in a stout man of thirty.

Symptoms.—The symptoms of cancer of the prostate are at first simply those caused by the increased size of the organ, obstruction to urination, frequency of the act, and pain. Increase in size does not occur as rapidly, or with as acute symptoms, as does inflammatory enlargement; but more painfully and more rapidly than senile hypertrophy. When cancer becomes engrafted upon an hypertrophied prostate, its diagnosis during the early stages is impossible. The diagnosis with hydatids or cysts (dilated follicles—of quite common occurrence, but of no pathological importance) is made by the progress of the affection. The symptoms, then, of cancer of the prostate are not pathognomonic at first, but there are certain important aids to correct diagnosis. Thus, if the affection be scirrhus, the peculiar hardness will be significant; if medullary cancer, the enlargement felt through the rectum is usually less uniform than in hypertrophy, and certain spots may often be felt softer than others, sometimes amounting to a feeling of deep fluctuation. The pain on pressure by the rectum is less decided than in inflammation, but more positive than in hypertrophy. The glands in the pelvis and in the groin sooner or later enlarge, and assume cancerous characters. Hence the existence of obscure swellings along the course of the iliac vessels, felt through the abdomen, is an important aid to diagnosis. Cancerous cachexia is slow to appear. Its presence clears up any doubts which may have existed.

The importance of the existence of cancerous growths elsewhere is evident, and especially is this true of cancer of the testicle or kidney. The pain felt in cancer of the prostate is noticed largely in the rectum and about the sacrum, or radiating into the back, or down the thighs. Hæmorrhage from the urethra is a symptom liable to appear both early and late in this affection. The blood flows freely, is arterial in character, and often excessive in amount. It may appear spontaneously, or, more frequently, during urination. A certain amount of relief to the symptoms is apt to follow such hæmorrhage. The urine is troubled, purulent, often containing considerable *débris* of tissue. Sometimes a shred of tissue of considerable size is passed, or pulled away in the eye of a catheter. From such a shred a diagnosis of cancer can sometimes be made by the microscope. Diagnosis based on finding so-called cancer-cells in the urine is entirely unreliable. Retention is apt to occur from obliteration of the prostatic urethra by cancerous growth. In such cases catheterization is difficult and exceedingly painful, while the operation is pretty sure to provoke considerable bleeding. Hypertrophy of the bladder with dilatation, and perhaps stone, may come on, as in other obstructive prostatic disease. The duration of the disease is set down, from first appearance of symptoms to fatal termination, at from one and a half to five years for adults, three to nine months for children.[1]

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[1] Quoted by Pitha, *op. cit.*

Treatment.—This is symptomatic, and consists in the careful employment of the catheter, if required, or even the establishment of a permanent opening above the pubes, with alkaline diluents, tonics, and anodynes in suppository, and by the stomach. Patients do not recover from this disease.

Simple cysts in the prostate are not uncommon; hydatids are rare.

PROSTATIC CONCRETIONS.

The adult prostate contains certain bodies known as prostatic concretions. They are visible with the microscope at any time after puberty, but do not attain considerable size until adult or advanced age. Thompson[2] has described them minutely. They are not to be confounded with stone of urinary formation. They are often found of very small size in the voided urine. In such cases they have no pathological significance. During their forming stage (when they measure from the one-thousandth to the one-hundredth of an inch) they appear under the microscope of an oval or slightly angular form, of pearly lustre, and in varying shades of light-yellow color. This color increases in the larger concretions to a deep orange. They have a cellular appearance, but no nucleus, and, as they become larger, exhibit concentric rings of different thickness. Often, in the larger concretions, many of the smaller bodies seem to have been lying together, and to have become surrounded by concentric layers of yellowish material to form one mass. Often, lines are seen radiating from the centre toward the circumference, and in the direction of these lines cleavage takes place, when the masses are subjected to pressure. When young they are very soft, but, as they increase in size, they become exceedingly hard and stony. The young cell-like bodies are not affected by acids, or alkalies, or ether; but the larger dark bodies are rendered somewhat more translucent by alkalies, while the mineral acids (especially sulphuric) usually occasion liberation of bubbles of gas (carbonic acid) and some shrinkage in size, sometimes disintegrating them into a mass of amorphous matter, which still retains its color and bulk. Hot nitric acid dissolves them, producing a faint yellow color.

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[1] Holmes's "System of Surgery."

[2] "The Enlarged Prostate."

The larger concretions consist of a protein substance, with phosphate and carbonate of lime. They are often found, visible to the naked eye, in the urethra, around the veru montanum, chiefly after the age of fifty. It may be necessary to make a section of the prostate to find them, placing the milky fluid scraped from the cut surface under the microscope. In one case, Thompson estimated the number to be seen by the naked eye as amounting to several thousand. These bodies occupy, anatomically, the ducts and follicles of the secreting structure of the prostate. The earthy salts are added to them as they grow. They sometimes attain the size of a pea or small nut. As they enlarge by new accretions upon their circumference, they press upon and cause the absorption of the duct or follicle in which they originated, and several of them may be found adhering to each other in a single sac or cyst.

From the above description it may be gathered that these concretions resemble salivary or biliary concretions rather than true stone. When they become large enough to constitute sources of irritation, dense, opaque, earthy matter deposits upon them, and they then become true prostatic calculi, and may go on indefinitely increasing in size. These prostatic calculi are met with of all sizes and shapes. Several of them may be found separated from each other, perhaps embedded in cysts, which are dilated follicles, or, if many of them are present, causing atrophy of prostatic substance, until the prostate resembles a sack full of small stones, which may be felt rubbing against each other on pressure *per rectum*, giving an emphysematous-like crackling (Adams). In bad cases, prostatic calculi tend to unite, projecting into the urethra and forming curiously-distorted, branched masses, dipping down into the substance of the prostate, and extending forward into the canal of the urethra, and backward perhaps into the bladder. Such masses have been found four or five inches long. One, removed by T. Herbert Barker, is referred to by Thompson as being composed of nine portions, weighing, collectively, three ounces, four drachms, and one grain.

Prostatic stones are exceedingly hard, and have a polished surface. They may be brilliantly white, resembling porcelain, or of a fawn or pale-brown color. They are composed mainly of phosphate of lime, with a small admixture (derived from the urine) of the triple (ammonio-magnesian) phosphate. They very rarely give trouble during life, but when of large size they may give rise to all the symptoms of prostatic obstruction, in an aggravated form, leading, in the same manner, to chronic cystitis, hypertrophy, and sacculation of the bladder. When these calculi project into the urethra, a metallic instrument, introduced into the bladder, may be felt to grate upon them in passing.

Treatment.—The natural mode of elimination of these masses is by the formation of abscess. They may ulcerate out through the rectum, or perinæum, or into the urethra, or even into the bladder. Stone in the bladder not uncommonly coexists with them. When they become large enough to give rise to distressing symptoms, an attempt may be made to remove them with the long urethral forceps (Brodie), but the best method is to cut down through the perinæum in the median line, and extract every thing of a calculous nature which can be found. If any portion be left it becomes at once a nucleus for further incrustation. During such an operation the bladder should always be searched for stone. In exceptional cases where prostatic stones can be felt in the substance of the prostate through the rectum, an incision may be made through the walls of the latter, and their removal thus effected. Certain concretions found in the dilated veins around an old prostate and known as phlebolites, must not be confounded with prostatic calculi. They are not infrequently detected after death, and are small white or colored smooth bodies, perhaps as large as a pea, such as are formed in dilated veins elsewhere. The calcareous remains of old abscesses which have been absorbed, and which in rare instances are found in the prostate, must not be confounded with calculi. Finally, a true urinary calculus may become lodged in the prostatic sinus when small, and continue to grow there by deposits of urinary salts, causing absorption of prostatic tissue, and finally becoming embedded in that organ (Meckel, Adams). Such stones may grow backward into the bladder (prostato-vesical calculi, Vidal), or true stone in the bladder, becoming attached near the neck of the latter, may grow forward into the prostatic urethra (vesico-prostatic calculus).

NEURALGIA OF THE PROSTATIC URETHRA.

This is a disease rarely recognized as such. It is confounded with inflammatory congestion and other morbid conditions of the bladder. It has been described by authors, with especial accuracy by Civiale,[1] under the general head of nervous affections of the neck of the bladder. Civiale, however, states that the cause is often unknown, and in his cases frequently omits to state the age of the patient and the condition of his sexual relations and requirements. It is to bring this fact into prominent notice that the affection is mentioned under the head of prostatic diseases. It would involve needless repetition to describe it here. Its mainly prominent symptom is frequent (perhaps painful) desire to urinate, with no lesion ; in other words, simple irritability of the bladder. Its description will be found under the title "Neuralgia of the Vesical Neck" (p. 234). As will be there laid down, the sexual function is most often at fault in its causation, and not only the neck of the bladder, but the prostatic and membranous urethra, and even the whole canal at times, is involved, sensitive, irritable, congested, prone to contract, while hypochondriacal despondency and perverted intellectual function hold an important place in the picture of the disease. The connection of this affection with sexual causes has never been insisted upon, and yet this cause is, perhaps of all, the most prominent. It will be fully considered under the head of etiology of irritability of the bladder.

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[1] "Maladies du Col de la Vessie et de la Prostate."

Syphilis of the Prostate.—Although it is possible for syphilis to cause its peculiar deposit in the prostate, yet it rarely, if ever, does so. There is certainly no syphilitic condition of the prostate which can be diagnosticated except by analogy.

CHAPTER XII.

DISEASES OF THE BLADDER.

Anatomy.—Anomalies and Deformities, Exstrophy.—Hernia of Bladder.—Hypertrophy.—Atrophy.—Wounds.—Rupture of the Bladder.—Foreign Bodies.—Retention of Urine.—Incontinence: in Children, in Adults.—Tenesmus.—Chorea.—Hæmaturia.—Neuralgia of the Vesical Neck.—Cause.—Symptoms.—Diagnosis.—Treatment.

Anatomy.—The bladder is a muscular sac lying, in the male, between the rectum and pubes when empty, and distending, when full, into an oval bag occupying more or less of the hypogastrium. Its position is fixed below by the urethra, but mainly by the pelvic fascia, which, after having lined the cavity of the true pelvis, is reflected upward and lost on the bladder and rectum (as pubo-prostatic and inferior vesical ligaments) and the recto-vesical fascia which binds the prostate and neck of the bladder to the rectum. Above and on the sides the peritonæum covers the bladder, but is attached loosely, especially at the base, so as to offer no obstacle to any change in shape or position of the viscus. A knowledge of the reflections of the peritonæum upon the bladder is essential to a correct understanding of the methods of relieving retention by puncture. When the bladder is empty, it lies contracted behind the pubes; the peritonæum leaves the abdominal walls at the symphysis and passes at once to the bladder, over which it is spread, and then reflected upon the rectum from the base of the bladder, so that, when the latter is absolutely contracted upon itself, that portion of its base lying between the seminal vesicles is also covered by peritonæum, and there is, properly speaking, no direct relation between the bladder and rectum. Very different, however, is the condition when the viscus is distended. Then, as its cavity fills up, the peritonæum is carried with it. The recto-vesical *cul-de-sac* of the peritonæum is deepened and all that portion of the base of the bladder situated between the seminal vesicles lies directly in contact with the rectum. When the bladder is greatly distended, its base becomes thus uncovered for a distance, roughly estimated, of two inches behind the posterior margin of the prostate. In the same way the distended bladder carries up the peritonæum in front, so that a distance of one to two inches, or even more, above the symphysis becomes bare of peritonæum in extreme retention. Hence the election of these two uncovered spots for puncture.

The medium capacity of the adult bladder is eight ounces, subject to extensive variations from habit or disease. The bladder may become so contracted as to contain only a few drachms, or again capable of holding, without rupture, the better part of a gallon.

The muscular coat of the bladder is composed of a set of external fibres which run mainly longitudinally, some of them being continued up the urachus, and an internal set whose general direction is circular. These latter, greatly reënforced in number, encircle the neck of the bladand internal orifice of the urethra, and pass under the general name of sphincter of the bladder. Certain fibres, running across the base of the trigonum Lieutaudii, serve to pull upon and open the mouths of the ureters.

The mucous membrane of the bladder is of a pale salmon color, remarkably insensitive in health, covered by a stratified pavement epithelium, and lying in folds when the bladder is contracted. The glands are not numerous, except on the trigone and near the neck. Their office is to secrete lubricating mucus. They are exceedingly small, and composed of simple clusters of follicles. The coats of the bladder are united by connective tissue which is everywhere loose, except at the trigone.

The vesical arteries come from the hypogastric. The veins terminate in a thick plexus about the prostate and sides of the base of the bladder, emptying finally into the hypogastric veins. The lymphatics lead to the hypogastric ganglia. The nerves, partly sympathetic and partly spinal, come from the hypogastric plexus.

The neck of the bladder is that portion surrounded by the sphincter and base of the prostate, limited anteriorly by the ridge, more or less prominent in the adult, which maps out the posterior limit of the prostatic sinus.

The trigone (of Lieutaud) is a triangular space lying between the neck of the bladder and the orifices of the ureters. The muscular coat is here transverse, thick, adherent to the mucous membrane. Its posterior margin is limited by a more or less prominent ridge running between the mouths of the ureters. The ridge can be followed along by the prominence made by the ureters as they penetrate obliquely the muscular coats of the bladder.

The "bas-fond" of the bladder exists only after middle life, and is that part of the base of the organ lying behind the posterior ridge of the trigone. When the bladder is distended in later life, this portion lies on a lower level than the trigone.

The urachus is the remains of the allantoid prolongation. It often remains open for a short distance above the vertex of the bladder and sometimes continues pervious throughout, so that, in adult life, the urine still passes by the navel, but this is exceedingly rare.

The bladder in the fœtus, and in early life, is an abdominal organ, situated mainly above the pubes. As the pelvis enlarges it settles down behind the symphysis, and only rises into the abdomen when distended. The mucous membrane of the healthy bladder is less capable of absorption than any other. When deprived of its epithelium, absorption goes on as from other nude surfaces.

ANOMALIES AND DEFORMITIES OF THE BLADDER.

The bladder is almost invariably unique. Large sacculi have sometimes been described as supernumerary bladders, and they may indeed reach a size double or triple that of the bladder itself. They may always be recognized by being destitute of muscular covering. They are herniæ of the mucous coat through the meshes of the muscular tunic. Molinetti[1] describes a woman who had five kidneys, five bladders, and six ureters. Partial partitions extending into the bladder have been observed. Blasius[1] relates a case of perfect segmentation of the bladder by a partition, one ureter opening on each side. Podrazki[2] refers to several cases by different authors. The bladder is sometimes abnormally small, occasionally wanting, in which case the ureters may open directly into the urethra or into the rectum, or into a general cloaca, there being at the same time arrest in the development of other portions of the genital apparatus. Besides the above, there is one deformity, exstrophy, the occurrence of which is sufficiently common to demand a special description.

Exstrophy of the Bladder.—This deformity is found in both sexes, but much more frequently in the male.[3] In the female it is of less importance, as it may be more easily concealed, and does not prevent the performance of the sexual act. Cases of pregnancy and successful delivery at term are recorded. The subject will be considered here, however, only in relation to the male.

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[1] Quoted by Pitha.

[2] "Die Krankheiten des Penis und der Harnblase," p. 51, Erlangen, 1871.

[3] Mr. Earle (volume i., *London Medical and Surgical Journal*) alludes to sixty-eight reported cases, of which sixty were male. Isidore Geoffroy St.-Hilaire ("Histoire générale et particulière des Anomalies de l'Organisation chez l'Homme et les Animaux," Paris, 1825) estimates that one-fourth of the cases are female

The deformity is an arrest of development in the median line, analogous to hare-lip, and is found in different degrees. In a type case the lower part of the front wall of the abdomen and the front wall of the bladder are absent. The pubic bones are more or less widely separated from each other, their ends being united by a strong band of fibrous tissue. The posterior wall of the bladder, pressed out by the intestines, forms a mottled, red, tomato-like tumor, occupying the position of the symphysis pubis. Inguinal hernia of one or both sides is not uncommonly present, either partial or extending down into the scrotum, which is usually normal, containing the testicles. The penis is more or less rudimentary, and affected by complete epispadias. The ureters are sometimes greatly dilated, forming, as it were, rudimentary bladders. A good illustrative case is figured by Sir Astley Cooper.[1]

The above description applies to a type case. There may be variations in the absence of herniæ, a normal union of the pubic bones, the amount of the protrusion, etc. Ordinarily in the adult the mass reaches the size of the palm. With complete extrophy there is also always complete epispadias. A condition analogous to extrophy may exist where the bony union of the pelvis is lacking, but the anterior walls of the abdomen and bladder are perfect. Here there is a sort of hernia of the bladder forward. In such cases there is always some anomalous condition of the external organs of generation.

In exstrophy of the bladder, the patient's condition is miserable indeed. The thickened inflamed mucous membrane covering the protruded posterior wall of the everted bladder is constantly covered by decomposing "stringy mucus" of alkaline reaction, similar to what is found in vesical catarrh. From the orifices of the ureters, which can be readily seen by pressing back the protruded mass, there constantly distills a limpid, acid, healthy urine. This at once becomes alkalinized by contact with the inflamed mucous surface of the bladder, and goes into rapid decomposition, wetting the patient's linen and keeping him constantly surrounded by an atmosphere of ammoniacal, fetid gases, making him disgusting to himself and intolerable to his friends. The integument of the abdomen and thighs becomes excoriated and inflamed. The friction of garments in walking only serves to aggravate the existing difficulties, and the sufferer is in a condition truly pitiable.

By pressing back the inflamed bladder a small prostate is exposed, lying at the angle of the penis and the vesical tumor, and upon it the veru montanum and ejaculatory ducts may be plainly seen. These patients have erotic fancies and seminal emissions; but they are incapable of full erection or of perfect sexual intercourse.

Patients with exstrophy of the bladder have been useful to science in facilitating experiments upon the rapidity of the appearance in the urine of substances taken into the stomach. Thus it has been found that asparagus affects the urine in eight and a half, turpentine in four and a half minutes, etc. (salts much more quickly). Furthermore, they give positive evidence of the fact that the secretions forming on the surface of an inflamed bladder are alkaline, and that the urine coming down healthily acid from the kidneys is at once alkalinized on reaching the bladder and promptly decomposed. Hence the rule to give alkalies to correct alkaline urine where such alkalinity is due to bladder inflammation, since by this means the urine is rendered less acid and less irritating as it comes from the kidney.

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[1] Volume i., *Edinburgh Medical and Surgical Journal.*

Treatment.—Attempts made to destroy the vesical mucous membrane by cauterization and leave cicatricial tissue in its place have proved unsuccessful. Plastic operations have been performed with sufficient success to justify like attempts where the patient is willing to assume the risk of a fatal termination to an operation undertaken to relieve a deformity which does not threaten life. Usually several operations are necessary to reduce the aperture to a small size; but, even when the flaps slough, the subsequent contraction of the cicatrix is said to improve the local condition. If an operation is to be performed, each case forms a study by itself. Usually a large abdominal flap is dissected up from above the tumor and turned down over it, epithelium inward. The raw external surface of this flap is covered by one or more side-flaps or by integument taken from the thigh; such flap or flaps are secured in place over the abdominal flap by bringing the raw surfaces into contact, and fixing the whole by sutures. Some sloughing is to be anticipated, and subsequent operations have to be devised to meet the requirements of special cases. The most that can be done is to inclose the bladder, leaving an opening below, through which the urine flows unrestrained, as it is impossible to reproduce a sphincter. Finally, a suitable urinal is adjusted and worn constantly.

John Wood[1] reports a case which seems to be an exceedingly good example of what may be effected. A boy seven years old was operated upon four times, and the bladder was closed in—all but a small hole large enough to admit the little finger. The patient was able to retain two ounces of urine, but any cough or other contractile effort would expel it in a jet. The patient died six weeks after the last operation, from erysipelas. Ayres, of Brooklyn, Pancoast, of Philadelphia, and many foreign surgeons, report cases where alleviation of some of the symptoms was effected by operation.

The most that can be promised by operative interference is to leave behind a fistula, more or less large, over which a urinal must be constantly worn. The patient's virility is not returned to him, nor is his condition very materially bettered.

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[1] *Medical Times and Gazette*, 1865, vol. i., p. 115.

A less dangerous and equally efficacious mode of treatment seems to be to adapt a suitable urinal to the parts as they are left by Nature, such a one as shall shield them from injury, and keep the patient dry and clean. A urinal of this sort exists, and about a dozen patients in the United States, male and female, have attested its sufficiency for all practical purposes. It was originated by Mr. Earle, of St. Bartholomew's Hospital. It is figured by Vrolick,[1] and again by McWhinnie.[2] It consists (Fig. 75) of a metallic shield, preferably of silver, sufficiently bulged to contain the protruding vesical wall without coming into contact with it. The edge is rounded off so as to make for itself, by pressure, a deep groove around the vesical tumor. From its lower part, which is slightly bellied downward, extends a tube upon which is fitted a long, flat rubber bag, to be worn strapped to the thigh, and to serve as a reservoir for the urine. The bottom of the bag terminates in a metallic screw, which can be removed to allow the urine to drain off. The metallic shield above is held in place by a truss, which serves at the same time to retain any hernial projections in the groin. The instrument may be kept clean by the use of a weak solution of permanganate of potash. While wearing it the patient is preserved from any friction. All the urine is collected as it flows, and a considerable degree of comfort is obtained, while, with a little care, all offensive odor may be avoided, and the patient put in a position to attend to all the ordinary duties of life, without being objectionable to those around him.

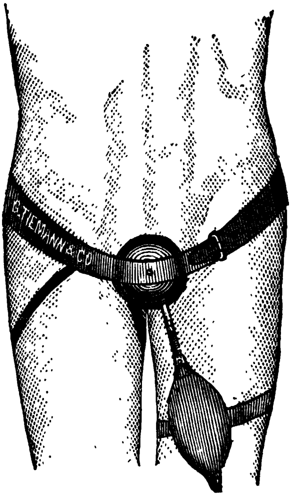

FIG. 75.

HERNIA OF THE BLADDER.

Dislocation of the bladder in the form of hernia may be congenital (rarely), or come on later in life, especially in old age, from exertion, retention, or violence. Abdominal, inguinal (scrotal, sometimes on both sides), crural, perineal, ischiatic herniæ, and cystocele through the foramen ovale (Lentin), have been noted. In women, vaginal and femoral cystocele are most common; in men, scrotal—that portion of the bladder uncovered by the peritonæum being found in the hernia. The bladder may alone constitute the hernia, or coexist with a portion of intestine, perhaps being adherent to it. Cystocele has been opened by mistake in operations for strangulated hernia. Pott records two cases. Stagnaof urine, with inflammation of the bladder and formation of stone, may result from cystocele; finally the hernia may become (rarely) strangulated.

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[1] Plate 604, "Cyclopædia of Anatomy and Physiology."

[2] *London Medical Gazette*, 1850, vol. xlv., p. 360.

The diagnosis is usually easy, especially with a catheter, since the tumor increases when the bladder is full, and may be emptied by pressure, such pressure causing a flow of urine through the catheter.

Treatment.—Replace the tumor, if possible, and retain it by a truss. If it be irreducible, a suspensory bandage should be worn, and the tumor *emptied, by pressure, during urination. If it become strangulated,* herniotomy must be performed. A knowledge of the possibility of cystocele is the best safeguard against mistaking it for ordinary hernia. The distinction becomes more difficult if the retained portion of the bladder is much thickened by chronic inflammation, or contains stone.

HYPERTROPHY OF THE BLADDER.

Hypertrophy of the bladder as a spontaneous affection does not exist. It is exceedingly common in connection with any morbid condition which prevents the free outflow of urine (hypertrophy of the prostate, stricture, tumors), with stone, or in connection with cystitis from any cause (hernia of the bladder, etc.). The different forms of hypertrophy (concentric, eccentric, with sacculi) are described as part of the disease, in connection with the morbid conditions occasioning them. Civiale speaks of a partial hypertrophy of the bladder, affecting chiefly its anterior wall, depending upon chronic inflammation or tubercular infiltration—evidently not simple hypertrophy.

ATROPHY OF THE BLADDER.

In rare cases in reduced, soft-fibred, debilitated individuals the bladder is sometimes found weak and thin, apparently atrophied in all its coats, and liable to rupture. Civiale gives the caution of avoiding pressure on the bladder-walls during catheterization in weak subjects, for fear of perforation. Bonnet, Hauf, and Hunter,[1] give examples of sudden rupture of the bladder in young persons from this cause. Atonied bladders, and those whose nervous supply is cut off by spinal or brain disease, undergo more or less fatty atrophy.

WOUNDS OF THE BLADDER.

Wounds of the bladder are not common, since the position of the organ protects it from ordinary accidents, inclosed as it is, when in a state of relaxation, by the bony pelvis. Excepting the violence done by instruments in lithotomy, possibly in lithotrity, or during other operations, the bladder is but little liable to injury except during distention.

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[1] Quoted by Pitha.

It may be perforated by a fragment of bone in fracture of the pelvis. Rising above the symphysis pubis it becomes exposed to incised, punctured, and gunshot-wounds. Wounds of the bladder are exceedingly dangerous to life, without being necessarily fatal. Bullets and fragments of shell have entered the bladder without producing fatal consequences,[1] and there formed nuclei for calculus—as have also portions of bone.

Treatment of injuries of the bladder is that of symptoms and indications—arresting hæmorrhage, and making a free outlet for urine, as well as providing an escape for any extravasated fluid. No matter where the perforation may be, if infiltration is going on, it is always better to set the bladder at rest by a free perineal incision, as in lateral lithotomy, so as to prevent the viscus from filling up. Rest, supportive treatment, and the combating of peritonitis, if it arise, by the early and free use of opium, constitute the outline of treatment. This course is preferable to the practice of tying a catheter in the bladder, which could not fail to prove an additional source of danger.

RUPTURE OF THE BLADDER.

A bladder, when over-distended by urine, may become ruptured by external violence, and this especially if it be atrophied or thinned by disease, ulceration or otherwise; or the accident may occasionally happen if the bladder were previously weakened in any part by the accumulation of urine alone, as in case of stricture. Usually, under such circumstances, the immediate cause has been muscular contraction. The most frequent cause of rupture of the bladder, as commonly met with in practice, is a fall, the bladder being distended. Imperforate urethra is an efficient cause in the fœtus. Among traumatisms, where the viscus is not weakened by previous ulceration, falls, blows, and crushing injuries, with or without fracture of the pelvis, or even appreciable injury to the soft parts, may be mentioned. The most common position of the rupture is in the posterior wall of the organ, the fissure usually including the peritoneal coat. Other portions of the bladder-walls occasionally suffer.

The symptoms are sudden occurrence of intense pain in the abdomen, with urgent desire to pass water, while attempts to urinate are usually, but not always, ineffective.[2] Ordinarily the patient is unable to walk from the first. Collapse soon follows. Death may occur in this stage, or the patient reacts and passes into a state of acute peritonitis, or suffers from symptoms of peritonitis with those of infiltration. If he survive the acuteness of this attack, the symptoms merge into those of local peritonitis, constant and often ineffectual desire to urinate being still a prominent symptom.

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[1] I have recorded in the *New York Journal of Medicine*, May, 1865, the case of an adult whose bladder was perforated when distended, by a bullet, during the New York riots, in July, 1863 (the gentleman being a looker-on), terminating in complete recovery. —VAN BUREN.

[2] Erskine Mason, "Rupture of Urinary Bladder," *N. Y. Med. Journal*, August, 1872

The catheter passes generally without difficulty, and clear urine may be drawn, or urine tinged with blood. Whenever a diagnosis of ruptured bladder can be made, a very guarded prognosis must be given, as a vast majority of the cases terminate fatally. Of seventy-eight cases collated by Stephen Smith,[1] there were but five recoveries. The prognosis is naturally more grave where the extravasated urine has entered the peritoneal cavity, than where it has only escaped into the cellular tissue of the pelvis.

Treatment.—It is unwise to temporize by the introduction of catheters. Sound surgery calls for an opening at once in a dependent part of the organ, so that no accumulation of urine whatever can take place. The lateral operation for stone must be performed, the neck of the bladder being incised and stretched so that the urine will drain off without accumulating. If fluctuation can be felt in Douglas's *cul-de-sac*, the latter should be punctured with a trocar and the fluid evacuated. The advantages of this method of treatment, introduced by Dr. Walker, of Boston, are ably discussed by Mason, in the case referred to. In only two reported cases has this operation been tried thus far—both were successful: in one, Walker's, the rent was in the anterior bladder-wall, complicated by fracture of the pelvis; the other, Mason's, was complicated by general peritonitis.

The unsparing use of opiates to keep down peritonitis, and meeting any symptomatic indications which may arise, constitute the remaining treatment.

FOREIGN BODIES IN THE BLADDER.

Besides the foreign bodies which find their way into the bladder through wounds, or come down the ureters (renal calculi), a host of substances have been encountered in the bladder, introduced through the urethra. All unimaginable articles, such as pins, beads, stones, pieces of straw, heads of rye, heads of wheat, portions of glass, tubing, pipe-stems, lead and slate pencils, portions of chalk, wax, etc., have been found in the male bladder, introduced there through the urethra under the influence of morbid erotic fancies. The budding sexual instinct of a boy yearns for satisfaction, but finds none; is thoughtlessly stimulated by the youth himself, by impure thoughts or books, often kindled by those who are older. An uneasy feeling of a desire to do something leads a timid boy to masturbation, and tempts him to play all sorts of pranks with his sexual apparatus. In this way, substances, of every conceivable description which the orifice of the urethra will admit, are introduced into the canal and again extracted, until, on some unlucky occasion, the object slips beyond the grasp and remains fixed in the deep urethra, or the bladder. The patient's shame will often prevent him from seeking relief; a small smooth foreign body in a healthy bladder may create no disturbance at first, and so the patient goes on, supposing that every thing has arranged itself, until, in after-years, perhaps long after he has forgotten his boyish folly, he gets bladder-symptoms, is cut for stone, and the latter is found to have formed upon a nucleus introduced from without.

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[1] *New York Journal of Medicine*, 1851.

Not infrequently, however, a foreign body comes legitimately, as it were, into the bladder; dermoid cysts containing bones, teeth, and hair, may discharge into its cavity. The broken end of a metallic, or, more commonly, a gum-elastic catheter, may constitute the foreign body, usually in cases where the individual is obliged to have frequent recourse to a catheter for the purpose of emptying his bladder. A catheter is most apt to break at the eye. The old-fashioned gutta-percha bougie is particularly dangerous, on account of its liability to become brittle when old. Such bougies should not be used. Again, substances of all sorts, bone, seeds, etc., may enter the bladder through ulceration into the rectum, while splinters, bullets, and bone, may be lodged there during injuries of the bladder.

Treatment.—If the foreign body be a portion of catheter or bougie, the patient will usually hasten to tell his troubles and demand relief. If, however, it is some other foreign body, he will probably seek aid for the cystitis it may have occasioned, but will steadfastly deny the knowledge of any cause, often indeed after the foreign body has been detected, or even extracted. When the nature of the substance in the bladder has been learned, an attempt should be made to extract it, to prevent it from becoming a nucleus for stone. If there be much cystitis present, rest in bed, with demulcents and some anodyne, for several days before the operation, would be advisable. Any thing which will go into the urethra would come out of it, if it could be correctly seized, with its points turned backward, and be drawn upon in a correct line; consequently, an attempt should be made to reach all long bodies (pencils), and all small bodies, by using a small lithotrite, or other forceps designed for this special purpose, of which there are several varieties kept by instrument-makers. If the object be seized in a faulty diameter, it may be released and caught again. This rule applies to portions of metallic catheters as well. It is exceedingly difficult to catch them correctly; soft catheters, however, are very easy to extract; they become doubled up, and may be withdrawn, however caught. The difficulty in seizing a portion of soft catheter is, that it cannot be felt on account of giving no click or grating against a metallic forceps; consequently, in the search for such a foreign body, the blades of the lithotrite have to be shut occasionally over different parts of the bladder-surface, and the offending body is pretty sure to be found, finally, between its jaws. Care must be exercised, of course, not to catch a fold of the bladder.

Two substances which may be introduced into the bladder demand a special notice—wax and glass. The former becomes so soft at the temperature of the body that it not only cannot be felt, but, if seized, can only be taken away piecemeal, while some portion is pretty sure to remain behind. As to glass, or other brittle substance, the danger of injuring the bladder by splintering the foreign body in attempts at extraction with forceps renders all such efforts, as a rule, unadvisable. Consequently, for all foreign bodies of wax or glass, and for all such as cannot be extracted after patient, gentle effort with the lithotrite or forceps, the median operation for stone should be performed, and this as early as possible, before the foreign body has had time to become incrusted with urinary salts. If, for any reason, it should be advisable to postpone the operation, it would be wise to wash out the bladder daily with a view of retarding calculous deposit upon the nucleus. Dr. Douglas, of Rondout, N. Y., in cutting a patient to extract a piece of glass, fearing that pressure with his forceps might splinter it in the bladder during extraction, devised the ingenious expedient of covering the blades of his forceps with soft molasses candy, knowing that if any of this substance was left in the bladder it would melt and pass away. The device was fully successful.

RETENTION OF URINE.

In retention the bladder fills up, and the urine is not or cannot be passed. It must be clearly separated in the mind from suppression, where no urine comes down from the kidneys. This distinction can always be at once established by percussing the hypogastrium. The causes of retention are varied: Voluntary retention, often repeated and long kept up, may result in positive inability to empty the bladder; all varieties of urethral obstruction—stricture, enlarged prostate, inflammation or acute congestion of the prostate, even spasm of the cut-off muscles—are capable of producing retention. Finally, true vesical paralysis will give rise to it, unless the cut-off and sphincter muscles are paralyzed at the same time, when there will be incontinence. Another cause of retention is found in the blunted sensibility of the bladder, which exists in certain high febrile conditions (typhus, small-pox), in coma, in some syphilitic and inflammatory brain-diseases, and in shock from injuries.

Symptoms.—In suppression (p. 352) there is always resonance over the pubes; in retention always flatness. The bladder may be often seen and felt, filling up the hypogastrium, perhaps reaching the navel. Pressure upon it usually causes a desire to urinate. Fluctuation may be made out between a finger in the rectum and the hand upon the hypogastric tumor. The bladder will not burst from retention of urine, unless it be previously ulcerated or subjected to mechanical violence when full (a fall or blow); after it has been over-distended for a time, a certain amount of dribbling will take place through almost any obstruction. From the effect of violence, or if the urethra be ulcerated or sensibly weakened behind a stricture, extravasation of urine may occur through the urethral walls.

The *treatment* has been already considered in relation to stricture and prostatic disease. In all other conditions—atony, paralysis, fever, etc.—a soft catheter of medium size should be passed every eight hours, and the bladder kept syringed out with water once or twice daily. When there is no urethral obstruction, a largely-distended bladder may so pull upon and distort the fixed curve of the urethra that an obstruction to catheterism exists just within the triangular ligament. The distended bladder rising out of the pelvis frequently produces a sharp angle in the urethra at that point. Hence, in case a soft instrument should be arrested here, a metallic catheter of accurate curve should be substituted, and managed with extreme gentleness, so as to avoid perforating the floor of the urethra. In cases of retention the aspirator will always afford speedy relief. Cazenave, of Bordeaux,[1] states that retention may always be relieved by introducing a piece of ice, about the size of a chestnut, into the rectum, repeating the same, if necessary, every two hours.

INCONTINENCE OF URINE.

Incontinence, like retention, is a symptom, and not a disease. In incontinence a portion or all of the urine dribbles away, or is passed involuntarily. Besides the true, there are two very common forms of false incontinence—the one nocturnal, occurring in children; the other in adults (stagnation, with overflow), where, after retention for some time, the excess of urine dribbles away. It may be stated as a rule, to which there are few exceptions, that an involuntary flow of urine in the adult indicates retention and not incontinence.

Nocturnal Incontinence in Children.—This disagreeable affection often depends upon mismanagement: children not being awakened at sufficiently short intervals to empty their bladders, and acquiring the habit of passing urine without being waked thereby. In other children, again, the malady is sufficiently marked to constitute a disease. In these cases the urine escapes during the unconsciousness of sleep, but not at other times. Such children are not necessarily weak, nervous, or choreic, nor do they belong to any particular constitution or diathesis.

Treatment consists in paying attention to the child's general hygiene, awakening it to pass water late at night and early in the morning, using moral suasion, and avoiding the use of fluids toward evening. Besides these means, absolute benefit may be expected from belladonna, commencing at a small dose, perhaps one-tenth of a grain of the extract, if the child is very young, and increasing gradually until some of the poisonous effects of the drug are noticed. Several other means may be mentioned which are often effective—blistering the perinæum, the use of actual cautery, touching it several times about the anus. Recently the use of chloral hydrat. has been advocated, the idea being to make the child sleep more profoundly. Another means which has appeared in the medical journals, and has been employed, it is said, with success in breaking up the habit, is sealing the prepuce at night with a drop of collodion. Mechanical appliances, encircling the penis or pressing upon the perinæum, have the disadvantage of tending to beget a habit of handling the parts.

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[1] *Journal de Médecine et de Chirurgie*, May, 1871.

INCONTINENCE IN ADULTS.—Stagnation with overflow or false incontinence has been already considered. True incontinence depends upon—

1. Unsymmetrical development of the prostate, where, after the collection of a little urine, the rest trickles away, there being no distention of the bladder.
2. Concentric hypertrophy of the bladder, where the viscus cannot distend, and all urine above a few drachms must flow at once away.
3. Paralysis of the "cut-off" and the sphincter muscles of the bladder with or without paralysis of the detrusor urinæ.

The treatment of these conditions is detailed elsewhere. It is advisable that the patient should wear a urinal.

VESICAL TENESMUS.

Cramp of the bladder is simply an uncontrollable tenesmus occurring in the course of several inflammatory diseases. Where there is no inflammatory condition present, it may be classed along with neuralgia of the vesical neck, in which condition it is often exceedingly severe.

CHOREA OF THE BLADDER.

This affection is rare, and seems to occur only in children. It usually coincides with other choreic symptoms. The following cases give a picture of the disease:

CASE XXII.— ——, aged six, a weakly, lymphatic boy, of rheumatic antecedents, growing fast, with a moderate appetite and large head, is brought by his mother, with the complaint that he wets his pantaloons while at play. He sometimes soils the bed at night, but not invariably. The boy knows when he wets his clothes, and runs to tell his mother. He invariably declares that he "cannot help it." He is an obedient, gentle little fellow, old enough to be ashamed of himself, and seems really desirous of holding his water, but, as he remarks, he "cannot do it." An attempt was made to correct the habit by having the boy called in at stated intervals from his play, for the purpose of emptying his bladder, but the involuntary, spasmodic escape of urine still occurred occasionally in spite of the fact that the bladder was not allowed to fill up. This boy had no other choreic symptoms, except in the muscles of his right eye Ordinarily, his eyes were straight, but, when tired, or excited, or angry, or frightened, his right eye would be drawn outward—sometimes outward and upward, the axis of the other eye being straight. This strabismus would come and go rapidly, varying according to the voluntary movements of eye. Moral suasion and belladonna were equally ineffective in relieving the vesical symptoms in this case, but tonic and general hygienic treatment always bettered the patient, until, in the course of two or three years, his bladder returned to a full possession of its normal functions, and his strabismus entirely disappeared. During this period, from different causes he would occasionally get run down in general health, lose flesh and appetite, and then his involuntary spasmodic emissions of urine day and night, and his tendency to intermitting strabismus, would return. The urine was always normal.

In this case there was evidently a spasmodic contraction of the detrusor urinæ of the choreic sort, over which the patient had no control. There was no stone nor inflammatory state of the bladder, nor any kidney-disease. He was never seen in the act of making water involuntarily, so that it is impossible to state whether the stream flowed in jets or continuously.

Case XXIII.— ——, aged fourteen, has always been a nervous boy. He is exceedingly sensitive in disposition, very bashful, easily excited, or brought to tears—general health fairly good. He has been under treatment for some time past, but without benefit. He is troubled with frequent desire to urinate, in paroxysms—the paroxysms seeming to be the culmination of excessive nervous fidgetiness. They occur especially when the boy is annoyed about any thing, and are almost always accompanied by a sensation of chilliness. He frequently wets the bed when asleep, and, when awake, the desire to urinate comes on so suddenly and so strongly that he often soils his clothing. With this he has a strong tendency to twitch the head and shoulders, as in chorea. He was put upon iron, quinine, and arsenic, with general hygienic directions about food, exercise, and fresh air. In two months he reported improvement. His treatment was continued, and he was ordered gymnastic exercise. Nothing further was heard from him.

Case XXIV.— ——, aged eight, is a fat, healthy, lymphatic boy; one of a large family of children, of whom nearly every male has distinct chorea, either generalized or affecting special muscles. Some of the older children have outgrown the tendency. The patient is troubled occasionally with slight general choreic twitchings, when from any cause his appetite is low, or his general health poor. Under such circumstances he has frequent paroxysms of intermitting, uncontrollable contraction of the bladder, forcing him to frequent micturition and attempts at emptying the bladder every few moments Sometimes the call comes so suddenly that he wets his clothing, and he also is unfortunate at night. When the boy is enjoying good general health, neither his general chorea nor his frequent calls to urinate disturb him. He improves under arsenic, quinine, or any general tonic or country air.

These cases, to which might be added several others, make out a distinct choreic condition for the bladder. It seems to be a rare affection, but this may be owing to the fact that it has not been looked for. It occurs, like most other choreic affections, in early life, and in conjunction with other symptoms of local or general chorea, more or less strongly marked.

Treatment.—Correction of any faulty condition of life by improved hygiene; iron, arsenic, quinine, cod-liver oil, and other tonics in the way of drugs, with electricity, constitute the treatment, and will probably triumph over any case. Local measures are not needed.

HÆMATURIA.

Hæmaturia is a symptom and not a disease, but it very often presents itself as the most prominent objective characteristic of a morbid condition. Often its cause is evident, sometimes so obscure that death alone reveals it.

Hæmaturia is the passing of blood with the urine. The blood may be free or in clots. There may be so little that it is only discovered by microscopic examination, by which means the amber bi-concave disks are easily detected; there may be enough to give the urine a peculiar, hazy, smoky hue, which is very characteristic of blood, even when there is no pink or red shade in the specimen; finally, it may be so abundant as to make the urine look like pure blood, or, if blood have been retained for a considerable time within the bladder, the urine may be colored almost black by it.

The blood usually comes from the urethra, the bladder, or the kidneys, and it is often of the utmost importance to decide from which of these three sources it is derived. There are but few distinguishing marks. If the bleeding is from the fore part of the urethra, some of it will reach the meatus between the acts of micturition; if behind a narrow stricture, or posterior to the membranous urethra, it will not. Blood effused into the urethra clots there, and assumes the shape of a leech, or of a tape or thread. Such clots are apt to come out with the first gush of urine, although, if there be a tight stricture, they may not be able to squeeze through until the stream is running at full force, and consequently would not appear until the middle or near the end of the flow. Blood from the seminal vesicles will be clotted and mingled with the yellow bodies found there, and with spermatozoa. Blood from the prostatic sinus is pretty sure to be clotted, perhaps in strings and threads mingled among flakes of pus-corpuscles. When blood comes from this region, the spermatic fluid in sexual intercourse is very apt to be bloody. Blood from the neck of the bladder may or may not be clotted. Often a few irregular clots will come first; then smoky urine will flow, and, finally, as the bladder expels its last drops, the prostate and vesical neck being squeezed, a little highly-colored urine, or fluid resembling pure blood, will be voided.

Blood flowing from any part of the bladder, and sometimes from the prostatic sinus as well, if it flows rapidly into an empty bladder, is pretty sure to clot in mass, and to dissolve afterward. If, however, it flows very slowly, or into a bladder partly filled with urine, it may not clot at all, but remain freely suspended in the urine, retaining its natural red color; or, after a few hours, becoming brown or black. Blood may clot in the pelvis of the kidneys, but coming down from the kidneys does so usually in a fluid state, either as red or black blood; fibrinous clots may, however, pass the ureters with symptoms of kidney-colic.

Blood from the kidneys has no special physical character by which it can be distinguished from blood coming from the bladder, except in those cases where blood-casts of the uriniferous tubules are found. These are pathognomonic. The quantity of blood flowing from a cancerous kidney varies very greatly, sometimes disappearing for weeks, and then recurring violently.

Rayer[1] says that, from a comparative examination extending over a length of time, of all the urine passed by patients with calculous pyelitis or cancer on the kidney, he noticed several times (*plusieurs fois*) that the urine voided three hours after eating was more than ordinarily loaded with blood.

When the blood comes from the kidneys, there is often pain or heaviness of the lumbar region of one or both sides. Blood may flow from the ureter if a calculus be retained there. Rayer has noted several such cases, in two of which there were also exuberant granulations in the ureter, which bled.

The origin of blood in the urine may in some cases be cleared up by a clever expedient resorted to by Thompson, for the differential diagnosis of pus from the bladder or kidneys in obscure cases. A soft catheter is gently introduced just within the bladder-neck, the urine drawn off, and the cavity washed out very gently with tepid water. If the water cannot be made to flow away clean, the inference is that the blood comes from the cavity of the bladder. If it will flow away clean then the catheter is corked for a few moments, the patient being at rest, and the first drachm of urine which collects may be drawn off and examined. The bladder is now again washed out, and, if after a single washing the second flow of injection be clear, while the drachm of urine was bloody, the inference is again complete that the blood comes from one or the other kidney. Bloody urine is always albuminous.

The causes of hæmaturia are very numerous. Among the most prominent may be mentioned all traumatisms of any character of the kidney, ureter, bladder, or urethra, all acute inflammations of any portion of the urinary tract, or of the seminal vesicles, from acute nephritis to gonorrhœa and urethral chancre, certain forms of pyelitis; all chronic inflammations of these same regions, especially if there be ulceration; overdoses of turpentine when the blood comes from the kidney, or cantharides when it comes from the bladder; stricture (Case XX.), (kidney stone, bladder, or urethral), strongulus of kidney, abscess, cancer, or other tumor of the kidney or urinary tracts; varicose condition of veins near the bladder-neck, villous tumor of bladder; finally may be mentioned spontaneous, so-called essential, hæmorrhage, sometimes recurring periodically once a month, like feminine menstruation,[2] the hæmorrhagic diathesis, critical hæmorrhage in certain febrile or other diseases (typhoid, variola). These discharges may come from any portion of the urinary mucous membrane. Paroxysmal hæmaturia, due to malaria, cold, exposure, etc., has been described by Harley,[1] Roberts,[2] and others. Hæmaturia is endemic in some localities, South America, Isle of France, etc. (due to the parasite *Bilharzia hæmatobia*).

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[1] "Maladies des Reins," Paris, vol. iii., 1841, p. 333.

[2] Rayer, *op. cit.*, p. 338.

Treatment.—The successful treatment of hæmaturia depends upon discovering a cause which may be removed (Case XX.). In any case, however, alkaline diluents are serviceable by rendering the urine less irritating.

Case XXV.—A healthy young gentleman during the heat of summer, while perspiring violently, was suddenly seized with symptoms of renal calculus, followed by profuse hæmaturia. This continued to an alarming extent, sufficient, in a short time, to reduce the patient to a condition of great emaciation and anæmia. He was now put upon large doses of citrate of potash, and his hæmaturia gradually disappeared. No calculus was passed.

During the tropical heats of a New York summer such cases are of not very uncommon occurrence.

The different hæmostatics are usually of no service, but they may be tried, and occasionally with advantage. Lead and opium (āā gr. j–ij), three or four times daily; ergot (fluid extract ʒ j–ij), or subcutaneously (gr. v of ergotine); aromatic sulphuric acid, ʒ ß–j doses; tincture of matico, ʒ j–℥ ß doses; alum, sesquichloride, subsulphate, and other preparations of iron, tannin, gallic acid, creosote, Oak-Orchard mineral water, Rockbridge Alum mineral spring, etc.

Rest on the back is often necessary above all things, and in this position ice may be applied with advantage to the hypogastrium, perinæum, and in the rectum. Lallemand employed nitrate of silver in the bladder, and iron and alum solutions have been injected with more or less benefit. It is necessary to repeat here one caution already given in another section: If the bladder becomes filled up with a large clot of blood, let it alone; no harm will come of it. It will dissolve and come away; any attempt to pump it out through a catheter, or break it up, or dissolve it, if successful, will only allow the blood to re-collect, and is fraught with the danger (for the patient) of exciting inflammation by violence. The best treatment is opium, to control desire to urinate, rest, and diluents.

NEURALGIA OF THE VESICAL NECK.

This most common affection of the bladder has received its clearest exposition from Civiale, who has devoted nearly a hundred pages to it in his "Traité des Maladies des Organes genito-urinaires," Paris, 1858. Phillips[3] treats of it as "contracture du col de la vessie," a title first given the disease by Caudmont, another Parisian surgeon, whose views are given in English by Dr. Slade,[1] of Boston. Gross[2] gives a case under the title of neuralgia of the bladder, using the term neuralgia in its English sense, to which the idea of pain is attached. The French expression "nevralgie" does not necessarily include the idea of pain, but signifies simply a nervous disorder—functional, not organic. The anatomical seat of the disease is the prostatic sinus around the seminal ducts as well as, and indeed more strictly than, the neck of the bladder. The nervous element of hyperæsthesia of the deep urethra and vesical neck bears a large share in producing the symptoms of nearly all bladder-diseases. Neuralgia in its pure form has very clear outlines, but the part it plays, when engrafted upon other bladder and urethral diseases, throws confusion into their diagnosis and chronicity into their type.

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[1] Med. Chir. Trans., 1865.

[2] "Urinary and Renal Diseases," second American edition, p. 151.

[3] "Traité des Maladies des Voies urinaires," Paris, 1860.

The causes of neuralgia of the vesical neck are numerous, but none holds the same prominence as does the perversion of the sexual instinct and appetite, its over-stimulation by excess, or, more often, its imperfect satisfaction—in short, irregular or ungratified sexual desire. The action of these causes is to congest and keep in a more or less constant condition of irritation the prostatic sinus in the neighborhood of the seminal ducts. This congestion extends readily in both directions, involving the cut-off muscles in front and creeping backward into the neck of the bladder through the inner orifice of the urethra. Rarely, if ever, does this affection occur in its typical form (simple irritability of the bladder, without inflammatory lesion)—rarely does it so occur where the sexual element is not at fault. It attacks men young and old, married and single, but the great majority of cases will be found in young bachelors, recently-widowed gentlemen, and old bachelors. Where the youth of the patient or the married state would seem to throw a sexual cause out of possibility, almost invariably there will be found, by close questioning, on the one hand masturbation or the encouragement of budding erotic fancies by impure thoughts and associations; on the other, excess, infidelity, or imperfect and unsatisfactory sexual relations. So close is the connection between an unnatural sexual condition and an unhealthy state of the neck of the bladder, that it needs but little practical observation of cases to convince one that these influences alone are to blame for the origin of some and for the long continuance of many other morbid vesical conditions.

Second to this sexual cause in producing neuralgia of the vesical neck comes the arthritic or gouty diathesis, that general blood condition attended by acidity and concentration of the secretions, local congestions so often of the tegumentary structures, with neuralgic and irritable habit. Finally comes a long line of causes including every thing capable of inflicting a structural change upon the tissues of the neck of the blad der or in its neighborhood (stricture, abscess, large prostate, inflammations, stone, worms, inflamed hæmorrhoids, fissure of rectum, etc.); and though these in themselves are not necessarily complicated by a neuralgia of the vesical neck, yet they keep up congestion there and often are thus complicated, where the urine is irritating, the constitution arthritic, or especially the sexual appetite at the same time perverted or ungratified. The nervous hypochondria, with despondency, the excited and suspicious tendencies so marked and remarkable in nearly all men at any time of life in connection with functional or organic trouble in the genito-urinary tracts, are only explicable by recognizing that Nature has implanted in man a sexual want which controls many actions of his life, impels him to continue his species and cries out in distress whenever it is trifled with, ungratified, or over-stimulated, or whenever its existence seems to be menaced. A man will feel more depressed at seeing a little excess of phosphate in his urine which he thinks, in spite of all proof to the contrary, indicates a local "weakness," than he will at loss of memory or mental incapacity which he can recognize himself and be fully conscious of. There are few men who would not rather lose a leg or an eye, than a testicle; while functional or organic disease of the bladder, testicles, or penis, causes more mental inquietude and distress to its possessor than does a cavity in a lung. Why should this be, except that Nature has endowed man with an instinct of terror at the idea of losing his sexual capacity, and has established a law for the regular and judicious performance of the sexual act, which he must obey or else suffer in some way the penalty? This suffering may not be evinced by symptoms in the organs of generation themselves, and probably will not be unless through excitement of these organs by abuse or irregular use, or unless through their stimulation by erotic fancies, the patient attract the morbid nervous tendency to a local explosion. A man perfectly pure in thought and deed would not suffer from vesical neuralgia, unless, of course, some physical lesion of the parts should first occur to excite local congestion. Old maids and priests suffer from sexual distress as much as young and old bachelors and widowers, but they very rarely give any local signs of trouble. Their symptoms may be scattered over all the organs, and may impair any or all of the functions.

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[1] *Boston Medical and Surgical Journal*, July, 1855.

[2] "Diseases of the Urinary Organs."

Symptoms.—Pure neuralgia of the vesical neck is synonymous with the condition vaguely known as irritability of the bladder. This affection is totally denied by some authors, who affirm that a lesion exists in all cases, and that it is simply a confession of ignorance to talk of pure irritability. The charge cannot be justly made. A cause for irritability can always be discovered, where there is no appreciable lesion, by studying the sexual wants and relations of the individual. It is expedient, however, to drop the term irritability of the bladder as meaning a disease, and to retain it in the signification only in which it has been adopted in this country—as indicative of that symptom, common to nearly all bladder affections, frequent desire to urinate, where the cause lies in the bladder—hence not in diabetes or hysteria. This at once reduces irritability from a disease to a symptom, and the term may be used in ordinary description as synonymous with "frequent desire to urinate." Irritability may be found in connection with inflammatory affections caused directly by the inflammation or in the same affections kept up and aggravated by neuralgia of the vesical neck.

The symptoms of a pure case are as follows: Frequent desire to urinate, the attack coming on sometimes suddenly, sometimes gradually, without appreciable cause, or perhaps commencing in an inflammatory condition of the parts (gonorrhœa), but not subsiding with the latter. This desire to empty the bladder may or may not be attended by a slight burning pain in the act. In severe cases there is powerful tenesmus (cramp). The relief after urination is usually not perfect, and the desire soon returns. There is often a certain slowness in the act, the bladder contracting without force, and the stream being small, or, on the other hand, the bladder may contract spasmodically, when the call comes, throwing out the urine with great force. Again, there may be spasmodic contraction of the cut-off muscles leading to inability to urinate, or hesitation in the act.

There are some prominent peculiarities about these calls to urinate. They rarely disturb the patient at night. Once asleep, he rests quietly, but, if from anxiety or other causes he is restless and wakeful, he is obliged to empty his bladder frequently, by night as well as by day. When under the stimulation of liquor, the urine can sometimes be held for a number of hours. When pleasantly occupied, or deeply interested in any thing, as at the theatre, in agreeable company, or engaged at some earnest work, the bladder is often but little if at all troublesome. On rainy, damp, or cold days, the calls to urinate are more frequent, perhaps once an hour. The same occurs during idleness, and especially during mental worry or disquietude. The spirits are usually depressed, the patient anxious, perhaps hypochondriacal. The urine is usually clear, rarely shows any purulent deposit (unless the affection has lasted for months or years), but often contains an excess of amorphous phosphates. This deposit sometimes alternates from week to week with a deposit of urates. Sometimes both ingredients exist in excess. Crystals of oxalate of lime are not uncommonly present. There is no soreness over the pubes, though pressure there will sometimes call forth a desire to urinate. In the rectum there is often a slight sensation of heat and uneasiness. There is frequently a dull, dragging, uncomfortable feeling in the perinæum—but pressure there is not painful. Erections may be frequent or absent—the latter to such an extent that the patient may believe himself impotent. There may be abnormal feelings of heat and tenderness about the scrotum and testes. Added to these there may be all sorts of functional disturbances of the bowels, often constipation, with feelings of lassitude, and general weakness. Spasmodic stricture of the urethra may come on as an accompaniment of this condition, while great irritability of the cut-off muscles exists as a rule. Nocturnal emissions are not infrequent.

On exploring the urethra with a full-sized blunt steel sound in these cases, it is customary to find the whole canal sensitive and irritable. The muscular fibres contract about the instrument, and oppose its progress. At the membranous urethra, the cut-off muscles contract spasmodically, often sufficiently to bar the progress of the sound entirely, and give the idea of organic stricture. As the instrument advances, the cut-off muscles may be felt to quiver in slight partial contractions, while the patient complains greatly of pain. When the beak of the sound enters the prostatic sinus, the patient is very apt to feel faint. He may indeed go into syncope, or have an attack of nausea; or, perhaps, a sexual orgasm may be induced, in which case the prostate and cut-off muscles contract violently upon the sound, causing the patient considerable pain. As the sound passes the neck of the bladder, either the natural feeling of a desire to urinate will not be perceived or (usually) the sensation will be highly exaggerated and painful. Sometimes spasm of the bladder will be induced and the instrument will be forced out, or a jet of urine may gush out along the urethra outside of the instrument. On withdrawing the sound, a little blood will often be found upon the beak, but the patient as a rule feels relieved, and will often experience for hours thereafter an ease and local comfort such as he has been a stranger to for months, perhaps for years; his interval of urination being decidedly lengthened, although the smarting at the next urinary act will be greater than before. The above general outline of symptoms will include most cases of pure neuralgia of the vesical neck, where there is no lesion, and has been no serious antecedent disease.

As for the symptoms of a nervous element complicating the different structural diseases of the genito-urinary tract, a detail is impossible. Suffice it to say the symptoms drag out, the disease tends to run a chronic course, attended by morbid excitability of the prostatic urethra, and an irritability of the neck of the bladder which is out of proportion to the lesions existing. This irritability is not constant, it is worse one day, better another, and subject to variations which no physical conditions can account for. Where such prolongation of the symptoms and an excitable state exist in connection with organic disease of the parts—but out of proportion to them—a profound study of the case will often bring out some sexual distress which is finding this means of expression.

Pure and simple neuralgia, if continued long enough, may finally lead to a mild cystitis around the neck of the bladder—especially if the patient give way to his frequent calls to urinate, and strain to void the last drops of urine, thereby mechanically bruising the congested vesical neck and exciting it to inflame; just as too frequent stools produce an analogous condition of the lower end of the rectum. After such inflammation has been kindled and true cystitis exists, the neuralgic element persists with it as a rule. The history of the advent of the attack, the excessive sensitiveness and irritability of the cut-off muscles, and a diagnosis by exclusion, will rarely fail to detect neuralgia of the vesical neck, as the acting cause of cystitis where it is so. Such cystitis may be prolonged for years and finally end in death, as in Gross's case, believed by that eminent surgeon to be of malarial origin.

These cases require more careful study than perhaps any other affection of the urinary organs, and are in many instances mistaken for and treated as organic disease.

Diagnosis.—The diagnosis of neuralgia of the vesical neck is easy when considering the sensibility of the urethra as above narrated, the insensibility of the bladder-walls when touched with the point of the sound, and the great fact that the urine of pure neuralgia contains no sensible deposit of pus, while that of cystitis always does. Where the two conditions coexist, the points noted above will help to clear up the diagnosis, and establish the neuralgic element, if it exist.

The treatment is simple, and, if it can be carried out, usually brilliantly effective. An alkali, if necessary, general hygiene, and attention to the sexual element—by marriage, if possible, by continence, if there is excess; by purity of thought and deed in any case—will place the patient in a curable condition. A mineral acid with possibly a little strychnine—if the urine be neutral or phosphatic; an avoidance of alcoholic beverages, and a cessation of the use of tobacco, may be required, with, possibly, change of residence, occupation, or habits that keep up an irritable condition of mind. With these general means nothing is so potent locally, in a pure case, as the use of a moderately-sized conical steel sound, well warmed and oiled, and introduced with the utmost gentleness. The time for reintroduction will depend upon the duration of the effect of a single use of the instrument. If there is prostatitis or cystitis, the instrument will aggravate the local condition; if neuralgia, its gentle use will always be followed by comfort, and the relief will last a variable time. In old subjects it is sometimes necessary at first to reintroduce the instrument every day; in younger people every second, third, or fourth day, until a cure is effected. The action of the instrument seems to be to blunt the morbid sensibility of the parts by pressure, to improve the circulation by temporarily squeezing out the blood, and by putting the irritated muscles lightly upon the stretch. No internal medication can be relied upon in this complaint. If the symptoms rise high and approach those of cystitis, a small amount of anodyne by the rectum may be serviceable for a time.

When a neuralgic condition of the vesical neck complicates and prolongs or aggravates an existing organic disease, even here the gentle use of the steel sound is often followed by marked benefit, although it may temporarily seem to aggravate some of the symptoms. In these cases the sexual element must be attended to in some way, while the best effects are often produced by a cessation from business cares, traveling a few weeks in the country, or a course of baths at some watering-place—the character of the water being a matter of small importance.

CHAPTER XIII.

DISEASES OF THE BLADDER.

Acute Cystitis.—Gonorrhœal Cystitis.—Diagnostic Table of Cystitis of the Neck and Prostatitis—Pathological Lesions in Cystitis.—Treatment.—Chronic Catarrh of the Bladder.—Atony of the Bladder.—Paralysis, Heterologous Deposits, and Tumors, in the Bladder-Walls.

Inflammation of the bladder, according to the anatomical portion of its walls involved, is known as—

Cystitis mucosa—catarrh of the bladder.

Interstitial cystitis.

Peri-cystitis; epi-cystitis.

These varieties, however, do not demand detailed and separate descriptions, since they follow one upon the other as grades of intensity of the same morbid process. Thus, it may be said that no form of bladder-inflammation can exist alone, except that affecting the mucous coat. *Epi-cystitis* may do so, but only as a peritonitis involving the outside covering of the viscus. Vastly the greater proportion of morbid causes acting to produce bladder-inflammation in the male exert their influence directly upon its mucous membrane, and consequently the modality assumed by the inflammation is that of catarrh of the free (mucous) surface. If, now, from long continuance or great severity of the catarrhal inflammation (formation of ulcers and sloughing), the morbid action should extend deeper and involve the connective tissue of the walls of the bladder, the cystitis at once becomes interstitial, possibly eventuating in abscess. During all this time the catarrhal cystitis keeps up, the interstitial variety being only an extension of the latter. Abscess may form in the bladder-walls, and break externally, without communication with its cavity.

Peri-cystitis is the formation of matter in the connective tissue around and outside of the bladder. This may result from an extension of interstitial cystitis, or may, and usually does, depend upon infiltration of urine, or external violence. The diagnosis presents no difficulties. The affection occurs after great mechanical violence to or in the region of the bladder, from infiltration or as a result of long-continued interstitial cystitis. In peri-cystitis a point of suppuration will be found sooner or later outside of the bladder.

During *interstitial cystitis* the bladder gradually contracts down, undergoing concentric hypertrophy; its walls thicken enormously, possibly reaching the thickness of an inch. Abscess may form in them; its cavity becomes nearly obliterated, perhaps down to half an ounce; incontinence ensues; the mass, like a hard, smooth, wooden ball, may be felt in the hypogastrium, or from the rectum, of a size varying with the duration of the disease. It may be as large as a man's first. It is not necessarily very sensitive to pressure, and is smooth and of even hardness on its surface. This condition of bladder-disease is not curable. Its walls cannot be redilated. Palliation is the treatment.

Inflammation of the bladder is not found as an idiopathic essential disease; that is, it does not occur except through the intervention of some cause acting locally. Thus, the effect of cold, so active in producing catarrhal inflammation of certain mucous membranes (conjunctival, Schneiderian, gastric, intestinal), is powerless to excite inflammation in a healthy bladder, however active it may be in kindling an existing congestion, or chronic inflammation, into an acute state. The apparent exception to this rule, found with certain acute diseases, and with paralysis from spinal or brain lesions, is explained by recognizing the local effect of over-distention, or of acid or retained (decomposing) urine (Case XXVI.). Gonorrhœal cystitis is a complication, not an essential disease. In cheesy tubercle and cancer, as well as in diphtheria, there must be a local deposit in the bladder-walls before cystitis comes on. The nearest approach to an essential cystitis, if it may be so called, is found in that form produced by an overdose of cantharides. This substance has the power of directly congesting the vessels of the neck of the bladder and prostate—and such a cystitis could hardly be called idiopathic.

From the foregoing it is evident that acute cystitis does not occur spontaneously, and is an exceedingly rare affection, except as an exacerbation of already-existing chronic disease, or from traumatic causes, mechanical or chemical (irritating urine). Chronic cystitis, on the other hand, is very common, so much so that there are few diseases of the urinary passages of which it does not form a part. Chronic cystitis, moreover (unlike many other chronic inflammations), rarely commences as an acute disease, but is chronic from the first, becoming afterward acute, from time to time, by the action of provoking causes. Chronic cystitis, therefore, would naturally demand consideration first, but, for convenience of description, the artificial order is adopted.

ACUTE CYSTITIS.

The causes of acute cystitis are fourfold:

1. Traumatic, mechanical, or chemical.

2. Extension of inflammation (gonorrhœa, inflammation of prostate, neighboring abscess).

3. Exacerbation of existing chronic inflammation.

4. Specific action of drugs (cantharides).

1. *Traumatic Causes.*—Any thing capable of doing mechanical violence to the bladder-walls, especially to its mucous membrane near the neck, may occasion acute cystitis. The rough use of instruments, as in crushing stone; wounds of the bladder-walls by mechanical objects, or fracture of pelvis; the presence of stone; pressure of a neighboring tumor. In the last two cases some chronic cystitis always precedes its acute manifestation: mechanical distention from retention caused by stricture, acute febrile disease, coma, or paralysis, acting in conjunction with altered urine; chemical violence, irritating injections, very acid and concentrated urine—all these act as traumatic causes.

2. *Extension of Inflammation.*—As in gonorrhœal cystitis, prostatic inflammation, neighboring abscess. Here, also, chronic inflammation, perhaps of short duration, appears first.

3. *Exacerbation of existing chronic inflammation* from the effect of cold, acid urine, rough treatment by instruments, spontaneous increase of symptoms depending on neuralgia of the vesical neck, a diphtheritic patch of membrane, etc.

4. *Cantharides, terebinthinates, etc.*, acting specifically.

Symptoms.—The symptoms of acute cystitis are the same, whether the affection be primary or engrafted upon an already-altered state of the local circulation. The calls to urinate are frequent and imperative, by night and day. The feeling of relief after micturition is absent. The act is accompanied by smarting pain, with tenesmus. Pain of a heavy, burning character is felt in the perinæum, and above the pubes, radiating thence, perhaps, to the end of the penis, to the loins and back, or down the thighs. The urine contains pus in greater or less quantities, at first evenly distributed through the fluid, then voided as stringy mucus (whence the name catarrh). Portions of bladder-wall may slough from the intensity of the inflammation, in which case the urine contains shreds of sloughy tissue, gases, etc., and has a gangrenous odor. The reaction of the urine, at first acid or neutral, becomes alkaline. Triple and amorphous phosphates are found deposited in excess. Blood appears in the urine in greater or less quantities, perhaps pure and liquid, or in clots. There is rarely a chill, but fever may run high, with all its accompanying symptoms, dry tongue, great restlessness, jactitation—hiccough, if gangrene be present. Mental inquietude, apprehension, anxiety and distress, are prominent features of acute cystitis, and are never entirely absent.[1]

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[1] It may be observed that cystitis, when acute, is a much more grave disease than when in the chronic form, especially if it extends from the neck so as to involve the body of the bladder. Toward the end, in a case which is to terminate fatally, constant but unavailing efforts at urination are a prominent feature.

Acute cystitis, from whatever cause, presents the above general group of symptoms. A few words of special detail are necessary regarding the gonorrhœal form.

GONORRHŒAL CYSTITIS.—This affection comes on during the existence of gonorrhœa, or urethritis, or even of a gleet—if the gleet depend upon the stricture—by direct continuation of the inflammation backward upon the mucous membrane. The inflammation is confined to the region of the neck, and does not attack the body of the bladder. It never appears until after the first week of a gonorrhœa, rarely till after the third week, when the urethral inflammation has reached the lower portions of the canal. It is more frequently seen in practice as a result of simple extension of inflammation later in the course of the disease. Often, however, a second or provoking cause has been in action, and without its assistance the complication of gonorrhœal cystitis might have been escaped. These provoking causes are any thing which will irritate the urethra; the use of alcoholic beverages, sexual intercourse, abortive treatment of gonorrhœa, catheterism, jolting, violent or even sometimes moderate exercise, where the urine is acid, and the patient nervous and excitable. Any of these causes may light up a mild cystitis of the neck in any patient with urethritis.

Symptoms.—The symptoms of gonorrhœal cystitis vary from a hardly appreciable irritability—with congestion—up to the very highest grade these symptoms (of irritability) can assume, with a tenesmus so constant as to amount to actual incontinence, the patient voiding a few drops of blood or milky fluid every few minutes. The tenesmus is particularly painful, although the mere passage of urine is often attended by great pain. The pus, or blood, flows most abundantly at the end of the stream. A noteworthy feature of gonorrhœal cystitis is the absence of general phenomena. Fever is sometimes inappreciable, and rarely runs high. Anxiety, *malaise*, and nervous distress, are, however, disproportionately prominent. Constipation is habitual. The urethral discharge becomes greatly lessened, or even disappears on the advent of the bladder-symptoms; as the latter disappear, however, the former returns. The habitual duration of the malady, suitably treated, is four or five days for mild cases, a fortnight for the more severe. As a rule, no functional disturbance is left behind by this affection, nor does it predispose to any more serious lesion of the bladder's neck or vicinity.

The only affection with which gonorrhœal or other acute cystitis of the neck is liable to be confounded is prostatitis. The two may be not infrequently combined, but, when separate, the distinction is easy. The following comparative table, from Fournier,[1] shows the characteristic differences:

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[1] "Dict. de Méd. et de Chir."

Cystitis of the Neck.	*Prostatitis.*
1. Characteristic vesical tenesmus, frequent uncontrollable calls to urinate.	1. Much less vesical tenesmus. Rectal tenesmus more marked.
2. Micturition particularly painful during the passage of the last drops of urine, when there is a convulsive contraction.	2. Nothing similar.
3. At the end of micturition excretion of a thick fluid—a mixture of pus and blood—often a flow of pure blood.	3. Nothing similar. Urine normal.
4. Simple perineal sensibility; pains irradiating toward the anus much less violent than in prostatitis.	4. Perineal pains deep, very violent, increased by movements, by defecation, etc.
5. Prostate normal.	5. Rectal exploration reveals a prostatic tumor—hard, very painful, etc.
6. No retention of urine.	6. Dysuria, retention of urine.
7. Slight or no general symptoms.	7. General symptoms well marked; fever, anorexia, etc.

That form of cystitis produced by cantharides is really a strangury. Great congestion of the vessels of the bladder's neck exists with constant tenesmus. It is rare to meet cases of this kind at the present day. Older authors refer to them produced by the administration of "love-potions" by "witches." Constant priapismus accompanies the tenesmus, and the result in the worst cases may be sloughing of the penis, and death.

The pathological changes produced by acute cystitis upon the bladder-walls and its membrane are, briefly, capillary injection of the mucous surface, changing the pale, salmon-tint into a brilliant crimson, the color being perhaps uniform, perhaps in patches, with a more or less punctate appearance. There may be ecchymotic spots, purple-colored patches mixed with the red. The mucous membrane is softened and swollen. These changes usually commence at the neck and often remain limited to this locality, but may extend over the whole internal surface of the bladder. The glandular follicles near the neck become involved, enlarged, and surrounded by a red areola. In certain high grades of inflammation, the membrane may be ulcerated, or patches of false membrane encountered. This croupous character has been especially observed in the cystitis caused by cantharides. True patches of diphtheritic exudation have been observed secondarily in the bladder. There may be sloughs of the mucous membrane, or of more or less of the thickness of bladder-walls, or interstitial thickening, with or without abscess (interstitial cystitis), or abscess around the bladder, in which case there will probably be more or less peritonitis.

With these evidences of acute cystitis may be mingled the marks of older chronic inflammation; such as a thickened, condensed, tough structure of the mucous membrane and bladder-walls, colored in purple and red or of a bluish-gray, slate-colored tint; trabeculization, sacculation, ulceration, perhaps pus in or around the bladder-walls; possible gangrenous patches; the mucous membrane may be incrusted with urinary salts, etc.

Treatment.—The treatment of acute cystitis from any cause—gonorrhœa as well—is always the same. It rests firmly, as already indicated for prostatitis (p. 208), upon the tripod of rest in bed, with elevation of pelvis; alkaline diluents; enough anodyne to relieve pain and tenesmus. To these may be added local application of heat. If there be any removable cause (presence of a catheter tied into the bladder), it should be taken away. If the cause be stone or a foreign body, no attempt should be made to remove it until the intensity of the inflammation has been quieted by the means above alluded to. If cantharides, turpentine, or cubebs, is being taken by the patient, it should be discontinued during the acute stage of the affection, to be resumed in the subacute stage. Copaiba sometimes works wonderfully well in quieting acute symptoms, but it cannot be relied upon. Asparagus should not be eaten by a patient with acute cystitis; common salt, strong coffee, and lemon-juice, should be also avoided. There is no occasion for any local or general abstraction of blood, but the medicines and measures detailed at pages 202–203 should be studiously enforced. If the cystitis be a strangury from cantharides, plenty of opium—or camphor in emulsion—and a very free use of diluents, must be relied upon. In all cases repeated use of a full hot bath has a soothing effect—or of the hip-bath. The rectum should be kept free by copious warm enemata, and opiates should be given by the rectum and not the mouth. Absolute rest, with the hips raised, and alkaline diluents, alone suffice in mild cases. If abscess form in or around the walls of the bladder, an opening should be made externally through the hypogastrium, rectum, or perinæum, at the earliest possible moment, to prevent perforation of the mucous membrane, and the possible danger of infiltration.

The key to the treatment of *peri-cystitis* is to open abscess wherever it tends to point, making the opening carefully and very early.

CHRONIC CATARRH OF THE BLADDER.

Of all the affections to which the bladder is subject, chronic catarrh holds the first rank in regard to frequency. It never occurs as an idiopathic affection, but is invariably a secondary result arising from other morbid conditions of the urinary passages. Once started, it does not tend to get well spontaneously, but to become slowly and steadily worse. Fortunately, its causes are well known, and most of them easy of demonstration. Many of these can be removed, and with them the chronic inflammation which they keep up. Some cases are incurable on account of permanent structural alterations in the bladder-walls, or where the cause cannot be reached. All, however, may be benefited by careful and judicious management, and there are few abnormal conditions of the body whose amelioration is attended by more satisfaction on the part of the surgeon, or more gratitude on that of the sufferer.

Causes.—Almost all the organic diseases of the urinary passages are attended, during some part of their course, by more or less chronic catarrh of the bladder; so much so, that a study of the altered condition of the bladder forms a part of the picture of the disease, and has to be considered with it. Hence most of the varieties of chronic catarrh are disposed of elsewhere under the heads of other diseases. For their study the reader is referred to the proper section (stone, stricture, prostatic disease). All causes of chronic vesical catarrh may be arranged under two grand heads:

1. *Mechanical,* including obstructive prostatic and urethral diseases, stone, morbid growths in the bladder or rectum, or around the bladder, hernia of the bladder, extrophy, retention of urine, sudden taking off of the pressure of accumulated urine from an habitually over-distended bladder, neuralgia of the vesical neck.

2. *Chemical.* Very acid urine (rarely), frequently decomposing, alkaline urine, from the liberated ammonia; urine containing pus, from pyelitis; atony, paresis of the muscular coats and true paralysis, inasmuch as they invariably tend to produce decomposition of the urine by stagnation.

Many, in fact most cases of chronic cystitis, result from the combined action of both mechanical and chemical causes. In obstructive disease from stricture, or large prostate, added to the mechanical stretching, the chemical action of the decomposing urine is always at work. The same may be said of retention. Retention alone, in a healthy bladder, will not necessarily cause cystitis, although it may do so from the mere mechanical violence done by stretching. The constant slight violence due to voluntary retention pushed beyond a normal limit, and often repeated, will eventuate in cystitis. The same holds good of the sudden but extreme retention occurring in coma, shock, the acute fevers, etc., if it be not relieved. In these conditions of unconsciousness, or delirium, the well-informed physician is always on the lookout for the state of the bladder, frequently palpating and percussing the hypogastrium to see that all goes well. It is very gratifying, in these cases, to observe the instantaneous relief which may be afforded by inserting a soft catheter, and emptying the over-distended bladder. Even if overflow has come on, the regular use of the catheter, preventing prolonged over-distention, may avert the impending cystitis and atony. Yet, in practice, not a few cases of cystitis will be found to take their origin in retention during fever, or unconsciousness, not promptly recognized. On the other hand very acid, or even slightly decomposing urine, would not excite inflammation in a bladder unless its circulation and tone were already impaired, as by atony, paralysis, etc. Finally, one other causative factor of cystitis deserves a word; namely, extension of chronic inflammation backward from a urethra or prostate already chronically inflamed.

Of the two sets of causes the *mechanical* act far more frequently, the chemical usually coming in to assist them in their work.

Chronic cystitis, from mechanical causes, is disposed of elsewhere (stricture, hypertrophied prostate, inflammatory, tubercular, cancerous or other prostatic disease, cystitis from stone).

Traumatic violence in the bladder, as elsewhere, is attended by inflammation. Morbid growths in or around and pressing upon the bladder, cause chronic cystitis by obstruction to free escape of urine, by calling an extra amount of blood to the part, and by the mechanical bruising which the bladder-walls sustain against them. Again, the tumors themselves may inflame, or their discharges cause decomposition of the urine, thus exciting chronic catarrh. In hernia of the bladder there is mechanical obstruction to circulation, with distention, and decomposing urine. In extrophy there are friction with clothing, exposure to the air, and mechanical obstruction to circulation. A bladder gradually accustomed to habitual over-distention may give its owner no appreciable annoyance, but the mechanical stretching here has modified and weakened the circulation of the part, and produced atony, and when all the tension is suddenly let up, and the bladder allowed to collapse, the blood is very apt to rush suddenly into and over-distend the weakened vessels, and result in a condition of inflammation, the type of which, however, at first, is more often acute than chronic—and grave at all times.

In long-continued neuralgia of the vesical neck, the mechanical, acting cause is the constant and continued bruising of the bladder-neck, by often-repeated, perhaps violent and spasmodic contractions in micturition. Added to this sufficient cause is a second one, namely, an extension of congestion backward from the engorged membrane of the prostatic sinus.

The chemical causes conducing to cystitis have been alluded to in connection with over-distention of the organ (stricture, enlarged prostate). Very acid urine rarely causes cystitis, being more apt to produce urethral inflammation; acting, however, upon an already-congested bladder, it always tends to heighten the grade of the congestion or inflammatory process. Decomposing urine will sooner or later light up cystitis, on account of the irritating properties of the ammonia which it evolves, and in atony or paralysis there would be no cystitis without the action of this cause (Case XXVI.). The irritating properties of pus alone are sufficient to occasion symptoms of cystitis, as when the pus is derived from the kidneys in pyelitis. Attention is especially called to this fact, because it is often overlooked. The patient complains of frequent painful micturition, and the urine is loaded with pus. The seat of disease is located in the bladder, and this organ is tormented by the use of instruments, or worried by useless stimulating injections—the true source of the pus (pyelitis) being overlooked.

Symptoms of Chronic Cystitis.—The symptoms of chronic cystitis resemble those of the acute form, in a degree proportionate to the grade of the inflammatory process. There may be only a little increased frequency of urination, with slight cloudiness of the fluid, as seen in the history of enlarged prostate; or the calls may be very frequent, and the pains excessive, varied, and constant, as in the acute disease. In fact, chronic cystitis is liable at any time to be lighted up into an acute state by the continued action of its own cause, or by the supervention of others (effect of cold, violent exercise, abuse of alcohol, acid urine). The urine of chronic cystitis always contains pus, either freely suspended through the fluid, or, more often, in gouts and clots of stringy muco-pus, more or less mingled with crystals of triple phosphates and with blood. Pus which is passed in the liquid state may become converted into "stringy mucus," while standing, by the alkaline decomposition of the urine, or the process may be imitated artificially in a test-tube, by adding ammonia or liquor potassæ to urine containing free pus. The latter immediately becomes translucent, coherent, and is indeed the substance commonly called "stringy mucus."

The special symptoms attending chronic cystitis are enumerated under the heads of the causes occasioning them, and need not be repeated here.

Treatment.—Chronic cystitis being an affection always entertained by some other morbid process, its treatment consists in the removal of the cause. Some of these causes are removable, others are not. In the latter case the treatment is palliative, and addressed to symptoms. After the removal of the cause the chronic cystitis will get well in early life, or at any age, unless there has been organic, permanent change induced in the bladder-walls (hypertrophy, sacculation). For these latter cases, or where the cause cannot be removed, the palliative treatment is as follows: For acute exacerbations, the same as for acute cystitis, based on the tripod attitude, alkali, anodyne; for the formation of abscess in or around the bladder-walls, besides the above, an early and carefully-made opening; for the continuous chronic state the treatment consists in keeping the urine, as it comes from the kidneys, slightly alkaline, washing out the cavity of the bladder with warm water, then with medicated injections (p. 197), if an instrument can be introduced; and in the use of a small amount of anodyne in suppository at night, when the pain is great. The balsam of copaiba, cubebs, turpentine, and the infusions of buchu, triticum repens, uva-ursi, flaxseed, etc., may also be sometimes of use. The value of counter-irritation over the hypogastrium must always be kept in view. These means, aided by as much rest as is consistent with health, change of air, and hygienic details in regard to food, etc., will effect all the relief that can be afforded. Where there is an element of neuralgia of the vesical neck in the case, it must be suitably treated (p. 239). The peculiarity of chronic cystitis, depending, as it always does, upon some other morbid condition, renders its special description unsatisfactory, and begets a necessity for constant reference to the other affections which underlie it.

Cystotomy for Chronic Cystitis.—Dr. Robert Battey, of Georgia, reports[1] a case of cystotomy performed as a last resource upon a patient with chronic cystitis, with the effect of affording much immediate relief, and prolonging life (he believes) for eighteen months.

Dr. Ingalls, of Chicago,[2] states that Dr. Powell performed this operation in 1866, and thereafter with good general effect, the wound being allowed to heal as after the operation for stone. In many cases it is only temporarily of service. It might be finally resorted to after the failure of other means, but with doubtful prospects of any permanent good effect; sometimes there is no relief, and often the trouble returns at once with the healing of the wound.

ATONY OF THE BLADDER.

Atony of the bladder is, as the name implies, simply a lack of tone in the organ. It is muscular paresis, and it is to be widely distinguished from paralysis, an affection of central and not of local origin, with which disease it is commonly confounded. Truly, a stretched muscle which will not contract is paralyzed; but, to avoid confusion, the term atony must be retained, paralysis only being applied where there is nerve-lesion. Every bladder suffers in a mild degree from what may be called physiological atony as the individual grows older. A healthy boy can throw a stream from his bladder to a much greater distance than he can when he becomes an adult, even taking into consideration the increased size of the prostate and enlarged calibre of the urethra, and the same remark holds true of adult life, when compared with healthy old age. The bladder being accustomed to a constant, slight distention, loses its expulsive power measurably with advancing age. Besides this mild condition of atony, however, there is a pathological form due to over-stretching of the muscular coats, either gradual and continued, or sudden and extreme (retention), or to constant congestion, as with hypertrophied prostate. Any one may observe the phenomenon of atony in his own person. If the urine be voluntarily retained for some hours after the bladder is full and the natural desire felt, it is noticeable, when an opportunity presents itself, and an attempt is made at passing water, that it is necessary to wait some time, perhaps several minutes, before the stream begins to flow. When it comes, it commences very gradually, and without force, getting stronger as the flow continues; finally, the last drops dribble slowly away. This is the mildest pathological degree of atony, and is caused by a paresis of the over-stretched detrusor urinæ. In men of sedentary habits, or those engrossed by absorbing occupations (students, actors), where the calls of nature are habitually disregarded, this slight degree of atony, often reproduced, may finally lead to a permanent lack of the expulsive power. *Sometimes actual retention may come on, starting in voluntary retention*, the bladder having lost its tone so far as to refuse to contract when an opportunity offers. Passing water habitually in the recumbent position, while lying in bed, is believed to be an occasional cause of atony. Predisposing circumstances are general weakness and laxity of the body. In some cases there seems to be a normal predisposition to this condition, while in others fatty atrophy may induce it.

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[1] *Medical Companion*, June, 1869.

[2] *Medical Record*, December, 1872.

The form of atony occurring with hypertrophied prostate does not necessarily depend upon mechanical overstretching. It is due to the constant congestion of the hypertrophied muscular coats of the bladder, kept up by the obstacle to the return-flow of venous blood from the bladder-walls, formed by the size of the prostate. With this cause, a certain degree of continual distention of the bladder-walls often goes hand in hand, and, where there has been retention, this circumstance takes its place as the most prominent cause.

Often, atony, from overstretching, owes its origin to retention of urine occurring in the course of acute disease (typhoid, variola), or temporary loss of sensibility (coma, concussion, compression) not recognized and relieved; or, most frequently, to retention complicating stricture in the young, enlarged prostate in the old. Nervous influence has no necessary connection with atony. The injury is mechanical; the overstretched detrusor urinæ loses its power, and is unable to expel the urine.

Symptoms.—The symptoms of this affection have been considered under the heads of its most constant causes, stricture and prostatic hypertrophy. To recapitulate for all cases: in complete atony, the expulsive power of the bladder being lost, the viscus fills up, and we have the condition named by Civiale "stagnation with overflow." The excess of urine, after the bladder has held all that it can, as a passive sac, flows over, upon some muscular effort of the patient (sneezing, violent coughing, laughter), or trickles passively away. In many of these cases of stagnation with overflow, the bladder is patient, and holds, perhaps, two or three pints constantly, without giving its owner any considerable uneasiness. What little excess collects over this amount occasions the normal desire to urinate. This is effected by voluntary contraction of the diaphragm and abdominal muscles, and perhaps an ounce or more of fluid is ejected in a dribbling stream. This brings relief for an hour, when the effort is repeated, with a like result. Such patients are apt to complain that their bladder is so small that it will only contain a few drops of urine, after the collection of which they are obliged to empty it, which they believe they do. Particularly are these frequent calls pressing, if, as is very apt to be the case, there is some cystitis along with the atony.

All the signs of an over-distended bladder are present with complete atony. The crucial test is the introduction of a catheter. As soon as the eye of the instrument reaches urine, the flow through the tube commences. It does not spurt out as from a normal bladder, but drops down nearly perpendicularly from the end of the instrument. A cough or a long breath will make it flow faster, as will also, very materially, pressure of the hand over the hypogastrium. Operations on the bladder seem sometimes to induce atony (perineal section, lithotrity).

Treatment.—The object of treatment of atony is to attempt to restore contractile power to a muscle which has been overstretched. The first indication is, obviously, to keep the muscle from any further violence, by catheterization performed three or four times daily. In the young we may always hope for a cure; in middle age for amelioration; but in old age with enlarged prostate the injured muscle rarely recovers its tone—nor, indeed, is it very desirable that it should do so.

Besides keeping the bladder from being again distended, we have a very effective means of hastening the return of the contractile power by the employment of cold injections into its cavity. If there be much cystitis with the atony, the cold should be used sparingly, but otherwise the bladder should be filled at each sitting with several successive injections, commencing at the first sitting with water of 90° Fahr., after this has flowed out, following with water at 85° Fahr., and a third time at the same temperature—never more than four ounces of fluid being thrown in at one injection. The water may be retained from one to two minutes, and then be allowed to drain off. This process may be repeated daily, starting at a temperature 5° Fahr. lower at each sitting and proceeding as directed above. Water may be injected as low as 40° Fahr., but it should be allowed to run out again immediately. It acts as a local douche, and is powerful for good in youth and middle life. This treatment may be continued for months, and it will yield good results if any such are possible. The cold douche applied to the hypogastrium, sacrum, and perinæum, is a good adjuvant to the injections. Local applications of electricity may also be employed, an insulated electrode being carried into the bladder, and the current passed directly through its walls to the other electrode in the rectum, or to a moistened electrode over the hypogastrium. No internal medication is of any service, unless possibly a mild alkali to keep the urine from exciting cystitis, or perhaps a little cantharides, strychnine, or ergot, for its specific effect. Tonics and general hygiene may be necessary in special cases.

PARALYSIS OF THE BLADDER.

As atony is common, so is true paralysis of the bladder uncommon. It occurs only in connection with nerve-lesion, or rarely as a functional nervous affection (reflex urinary paralysis, Brown-Séquard). The causes of paralysis of the bladder are brain-disease attended by hemiplegia (rare), partial paralysis from reflected peripheral nervous irritation acting through the spine (exceedingly unfrequent), any disease or affection of the spinal cord (inflammatory, apoplectic, syphilitic, cancerous, from pressure, Pott's disease, fracture of spine, tumor), especially if such spinal disease be attended by paraplegia, partial or complete. This latter set of causes, which may be summed up in the one word paraplegia, is by far the most active and efficient. Vesical paralysis may come on gradually, as sometimes in Pott's disease and in certain syphilitic paraplegiæ, or (most commonly) suddenly. In the former case the bladder discharges its contents from day to day more feebly, the change taking place perhaps so gradually that the patient does not notice it. Soon some of the urine is retained, only an excess over a certain fixed quantity being voided. This residuum goes through the changes of stagnating urine, and by decomposing lights up cystitis, the more readily on account of the weakened state of the bladder-walls due to impaired innervation. The patient now notices that his urine smells badly, is more or less muddy, perhaps full of thick, ropy mucus, and that he has frequent calls to urinate. Perhaps the paralysis may go no further, but the cystitis will continue to be steadily progressive unless arrested by appropriate treatment. On the other hand, the paralysis may go on to become complete, when retention will at once appear. Very rarely there is paralysis of all the muscles and true incontinence results; but this is so exceptional that it may be said not to occur. Most commonly, as the paraplegia comes on suddenly, so also does the vesical paralysis, and a bladder, at a given moment perfectly healthy, becomes at once incapable of contraction. Retention ensues, the urine over-distends the bladder and then overflows, dribbling away. The bladder becomes inflamed by the decomposing retained urine, pus, stringy mucus, earthy phosphates, vibriones, triple-phosphate crystals abound. The weakened bladder-walls may ulcerate extensively, or become incrusted with earthy salts, or stone may form. It is in some such deplorable condition as this that the bladder usually first receives surgical notice and attention, whereas the whole list of symptoms might have been avoided (except the loss of contractile power) by the application of the proper means at the proper time.

Treatment.—When a patient, from any cause, becomes wholly or partly paraplegic, his bladder should not be allowed to become distended. The catheter should be passed soon after the accident, and reintroduced three or four times daily, always with great care, on account of the insensibility of the parts, and the danger of lighting up cystitis mechanically. At the same time the bladder should be thoroughly washed out with warm water, once or twice after each introduction of the catheter. Colder water may be used later, but this remedy, so useful in atony, has little power over true paralysis of the bladder; on the contrary, it may do harm. Warm water is used simply for purposes of cleanliness, to take away the ferment, mucus, and to prevent cystitis. This can be done, probably, in every case that is properly managed. The following case illustrates the point:

CASE XXVI.—A gentleman of forty-five had an apoplectic effusion into the spinal cord, which was followed by immediate paraplegia and total paralysis of the bladder. The catheter was passed within six hours after the attack, and subsequently three times daily. Tar-water was used as an injection into the bladder. The viscus was kept clean, and was never allowed to become over-distended. Two years afterward his condition was as follows: There was total paralysis of the gastrocnemii and solei, with wasting of the calf, and some wasting and lack of power in the other muscles of the leg and thigh. The bladder was paralyzed, so that no drop of urine could be passed without the catheter, and the stream flowed perpendicularly from the end of the instrument. The rectal sphincter was paralyzed, so that the bowel protruded, unless retained by a pad. Yet there was no cystitis. The urine had a specific gravity of 1020, was acid and clear when passed, and continued acid after standing thirty-six hours. There was no excess of mucus, and no pus except a few little clusters of pus-corpuscles visible to the eye, and evidently coming from the urethra, caused by the constant use of the catheter. The patient had no frequency of desire to pass water.

All this was *two years after the occurrence of the paraplegia*, a period evidently long enough to establish cystitis, if it were a necessary consequence of the paralysis. Here the prompt passage of the catheter, and its subsequent use, which prevented stagnation, together with the injections to keep the bladder clean—for the tar-water was no better than simple water—averted catarrh of the bladder.

Where the patient is not seen until stagnation and overflow have occurred, it is more difficult to keep down the inflammatory outbreak, but the sooner it is attempted the more chance is there of success. After catarrh of the bladder has become thoroughly established, the treatment becomes mainly palliative, but even here much can be done by the systematic, regular use of the cathêter, with thorough washing of the bladder, first with warm water, and then with borax, or other mildly stimulating injection, as directed in cases of catarrh, with atony and enlarged prostate (p. 198).

Chronic cystitis being, as has been shown, a secondary disease, the main reliance of treatment, in any case, consists, after the removal of the cause, in the surgical measures already enumerated, injections into the bladder, medicated or otherwise, position, and external counter-irritation. The terebinthinate and stimulating diuretic drugs habitually employed, though of service in certain selected cases, are of far inferior importance. The value of these drugs is secondary, and is greatly overrated by the profession; they do more good as diluents than by any specific virtue, and, being generally combined with anodynes, the reputation which they enjoy is really more often due to virtues of these latter than to any special power of their own in controlling vesical symptoms.

HETEROLOGOUS DEPOSITS AND TUMORS IN THE BLADDER-WALLS.

The bladder is rarely the seat of any foreign growth, yet certain deposits and tumors are found here. These are (*a*) cheesy tubercle, (*b*) fibrous growths, (*c*) cysts, (*d*) cancer, (*e*) villous tumor.

These different new formations cause symptoms more or less severe according to their situation and size. Thus, by pressure on a ureter, they may lead to distention of that canal and of the pelvis of the kidney, with (possibly) final rupture of one or the other, or atrophy of the secreting portion of the kidney. Again, the growth may be near the neck of the bladder, presenting an obstacle to the escape of urine, which may even lead to complete retention; while, on the other hand, if it springs from the fundus away from the sensitive portions around the neck, it not only does not oppose any obstruction to the free outflow of urine, but, in exceptional cases, may give rise to little if any cystitis. Some of these tumors, again, become engorged with blood from motion or other cause, and then all the symptoms are aggravated. When a free flow of blood takes place, the symptoms remit and the patient feels better. The above remarks apply to the whole category of foreign growths taken together, and to no particular class.

(*a.*) CHEESY TUBERCLE.—Tubercle of the bladder does not occur as an isolated affection. It is not very often encountered in connection with pulmonary tuberculosis, but comes on more frequently with tubercular ulcerations of the intestines, and is especially common with similar disease of the kidney or prostate, or even with advanced tubercularization of the testicle, cord, and epididymis. The glands and follicles, usually, near the neck of the bladder and orifices of the ureters first suffer. Groups of little whitish elevations, surrounded by a red areola, may be seen at first, and these, going on to increase, coalesce and break down into cheesy degeneration and ulceration, sometimes leading to perforation of the bladder.

The diagnosis is mainly made by exclusion. The bladder-symptoms are simply those of chronic cystitis, more or less severe according to the situation of the deposit. There is rarely much blood in the urine. The exploring sound may sometimes detect the ragged ulcerations and appreciate the thickening of the bladder-walls. Beyond this, exploration is usually negative; no tumor is felt either by the sound in the bladder, or by rectal or hypogastric palpation; while the *débris* of tissue found in the urine has no distinctive characters. The diagnosis usually rests upon the general condition of the patient, and the state of the whole genito-urinary apparatus. Advanced phthisical disease elsewhere, of the lungs, intestines, etc., but particularly of the epididymis, with a ridgy, knobbed feel of the seminal vesicle and vas deferens of the same side, especially if there is evidence of prostatic trouble, and above all, any suspicion of tubercular pyelitis—any of these concurring symptoms makes the diagnosis probable, while all of them would make it certain. The disease occurs most frequently in youth and early adult life. They are always serious, generally desperate.

Treatment.—The treatment is the same as for phthisis elsewhere—proper warmth, fatty food, fresh air, out-door life, tonics, etc. Locally, anodyne suppositories, if pain be great, rest, alkaline diluents; finally, syringing the bladder with warm water occasionally, unless the introduction of the instrument produces too great pain. These patients rarely recover.

(*b.*) FIBROUS TUMORS.—These tumors are not common, but occasionally one or more of them are found in the bladder, where they give rise to trouble mechanically, being perfectly benign in character, composed of connective-tissue elements, growing in and from the submucous connective tissue. They appear first as slight elevations. These enlarge and grow into the cavity of the bladder, sometimes becoming pediculated. They are to be distinguished from the irregular polypoid overgrowths from the posterior urethral orifice of the prostate, and from supernumerary prostatic tumors.

Symptoms.—Careful sounding with a Thompson's searcher, or, perhaps better, a lithotrite, may detect the position, size, and perhaps the number of the tumors. The recent method of exploration introduced by Simon, of Heidelberg, namely, by a hand introduced into the rectum while the patient is anæsthetized, might be tried in obscure cases. The rarity of blood in the urine distinguishes them from villous growths. The amount of cystitis is usually not so great as in tubercle, while the cachexia and occasional profuse bleeding of cancer are wanting. Children and young adults are most liable to be affected.

Treatment is palliative—alkaline laxatives, anodyne suppositories if necessary, warm washing of the bladder, use of catheter, etc.

(*c.*) CYSTS are rare in or around the bladder, but occasionally they are found. They sometimes contain bone, teeth, muscle, and hair, which occasionally find their way by ulceration into the bladder, and constitute nuclei for stone, or give rise to pilimiction.[1] Hydatid as well as simple cysts have been encountered. A striking case of cyst of the bladder is reported by Liston.[2] The diagnosis was made with the aid of a catheter, which was being passed for retention. The instrument struck against a soft, movable mass at the neck of the bladder. Liston decided to perform epicystotomy at once, and removed a large cyst very like the bladder in volume, form, and appearance.

(*d.*) CANCER is rare in the bladder, but still it is more common than benign forms of tumor, or other foreign growths not inflammatory. It may originate in the bladder, but more often is an extension of disease from the prostate or bowel. When occupying the bladder it may grow from any portion of the walls, but usually springs from near the neck or orifices of the ureters. Different varieties of cancerous growth have been encountered. The encephaloid (soft) cancer is by far the most common. Scirrhous and the epithelial are less frequently observed; colloid cancer has been seen. The cancerous nodules develop under the mucous membrane in the walls of the bladder, and often grow to the formation of a considerable tumor. Encephaloid, especially, may grow out in a fungous manner, until it fills the whole cavity of the bladder. Cancerous growths go through the same phases here as elsewhere, finally ulcerating and destroying life by loss of blood or cachexia, or wearing out the patient by extreme pain.

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[1] "Mémoire de la Soc. de Biologie," 1850, Rayer.

[2] *Medical Times*, August, 1862.

The symptoms vary but little from those of other tumors. There may be the same mechanical obstruction to the escape of urine, due to the position of the growth, and calling for the use of the catheter, the same cystitis, more or less intense, according to the position and size of the tumor and the extent of ulceration; but in several particulars the symptoms of cancer in the bladder are special, and the diagnosis more easy than for other tumors. The pain is more severe, is referred to the back, loins, and thighs, as well as to the pubic and perineal region; enlarged glands may sometimes be felt along the brim of the pelvis. The bleeding is usually intermittent in character; at first there may be long intervals of months between the paroxysms. The blood flows suddenly and profusely, in clots and fluid, attended by great pain. After each bleeding the severity of the symptoms lessens. Between the attacks there is more or less oozing, sometimes enough to keep the urine constantly red; sometimes, during the earlier months of the disease, only to be detected by the microscope. The introduction of a catheter is very apt to occasion hæmorrhage, and should be avoided as much as possible. Sometimes shreds of tissue, projecting from the borders of an ulcerated, cancerous nodule, will be caught in the eye of the catheter, and be pulled away. The microscopic examination of such shreds may sometimes throw light upon the nature of the tumor. In the middle and later stages of the disease the cancerous cachexia may be marked, and the bleeding more constant and profuse, while the intervals between the paroxysms will be shorter. Finally, in scirrhus, the hardness can be felt by the finger in the rectum, and in the common form of cancerous disease, medullary, the size which the mass attains renders it nearly always easy of detection long before it has advanced far enough to be fatal. This growth has been mistaken for enlarged prostate. Its general size, shape, and position, may be studied out with the searcher, while the finger in the rectum will sometimes recognize a peculiar, soft, semi-elastic tumor behind the prostate, and be able to appreciate pressure made upon the tumor above the pubis. Cancer, here as elsewhere, is a fatal disorder. The treatment is purely symptomatic and palliative, keeping up strength by all known tonic and hygienic means, and using the same sedative and local treatment as for other tumors of the bladder, employing special means as they are required by special cases. Opium ranks first in usefulness.

(*e.*) VILLOUS GROWTH.—There is a peculiar growth encountered in the adult bladder, known as villous tumor. It occurs less frequently than cancer, but perhaps more frequently than fibrous or cystic tumors. It has been considered malignant, but can lay claim to the title on no score except that it often kills. It is a soft, pulpy body, growing to the size of a nut, constituted by innumerable villi, which branch off in every direction, are attached to the submucous connective tissue of the bladder, are identical in structure with the villi of the healthy chorion, and are exceedingly vascular. Several tumors may coexist in a single bladder, or a portion of bladder-surface may be found velvety, from being covered by small villous processes similar to those on the tumor.[1] The most usual site for these tumors is the base of the trigone, between the orifices of the ureters. There is nothing cancerous about their structure. Their cause is unknown. They never lead to secondary cancerous deposits elsewhere. They do not spontaneously ulcerate. The lymphatic glands are not implicated. There is no characteristic cachexia. When they kill, death seems due purely to loss of blood and exhaustion from pain.

The symptoms of villous growth are like those of other vesical tumors, except that they are less often obstructive, and that the urine has blood in it almost constantly. No tumor can be felt, as the mass is too soft to be recognized either by the finger in the rectum or the searcher in the bladder. Sounding almost invariably aggravates the symptoms, and gives rise to a fuller supply of fresh blood. Shreds of the tissue sometimes come away with the urine, and may show characteristic appearances under the microscope. The structure of the growth is simply an enormously wide, thin-walled vessel, curved on itself to form a loop, and covered by three or four layers of cylindrical epithelium, seemingly placed directly upon it.[2] The suffering is often intense, and vesical tenesmus very marked.

The treatment is mainly palliative—opium suppositories, internal hæmostatics (?) and mild astringent solutions (acetate of lead, nitrate of silver, tannin) injected carefully and tentatively into the bladder. These, with hygiene and rest, are all the relief that art at present affords.

In desperate cases an attempt might be made to open the bladder and remove the tumor, cauterizing its base. The difficulties attending such an operation do not need description to be realized. In favorable cases pediculated tumors of this sort have been successfully removed, and have not returned.[3]

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[1] "Lectures on Pathological Anatomy at Guy's Hospital," 1857 and 1858, Samuel Wilkes, 1859, London. [2] Rindfleisch, "Pathological Histology." [3] Ibid.

CHAPTER XIV.

STONE IN THE BLADDER.

Materials of which Calculi are formed.—Causes of Stone, internal and external.—Number.—Size.—Shape.—Weight.—Degree of Hardness.—Possible Consequences of Stone, including Symptoms, Pathology, and Modes of Death.—Symptoms considered in relation to Diagnosis and Selection of Mode of Cure.—Sounding.—Circumstances prejudicial to a Choice of Lithotrity.

The presence of a foreign body in the bladder is recognized by common consent as the cause of the most painful suffering to which humanity is liable. The foreign body in the great majority of cases is generated entirely within the urinary passages, most frequently in the kidneys; sometimes it is introduced from without, as when such substances as slate-pencils and hair-pins have been inserted into the urethra, under the influence of morbid erotic impulse, or a bullet, a portion of shell, or fragment of bone, has found its way into the bladder by gunshot-wound. In either case the result is a concretion of stony hardness resulting from the more or less rapid deposit or crystallization of the salts of the urine upon a nucleus, forming what is known, in common language, as stone in the bladder. In ninety per cent. of cases of stone the nucleus has been most probably an aggregation of crystals of uric acid, which, happening originally in the kidney, has passed, with or without attendant symptoms of renal colic, into the bladder, and failed to escape by the urethra. Of the remaining ten per cent. of nuclei, extraneous substances constitute, perhaps, the largest proportion, then blood-clots, or other organic products, such as a mixture like mortar, of altered, ropy pus, with a precipitate of urinary phosphates, or an aggregation of crystals of oxalate of lime from the kidney.

As to the subsequent growth of the calculus, there is endless variation, both as to its rate of rapidity and the nature of the materials which serve for its increase. These materials, derived from the saline constituents of the urine, combined with an uncertain amount of animal matter—the secretions from the vesical mucous membrane, pus, or blood—are deposited around the nucleus in concentric layers of varying thickness. As the chemical constitution of the urine is liable to constant change, the additions to the bulk of the calculus are correspondingly uncertain. Calculi consisting entirely of oxalate of lime, which are rare, are slowest of growth; next those composed of pure lithic acid; while stones of mixed character, in which the concentric layers are formed, according to the constitution of the urine prevailing at the time of deposit, of lithic acid or oxalate of lime, the amorphous urates phosphate of lime, or the triple phosphate of ammonia and magnesia, are very common, and of more rapid but uncertain growth. Calculi composed mainly or entirely of the phosphates grow most rapidly and attain the largest size.

The phosphatic salts, always present and held feebly in solution in the urine by an excess of phosphoric acid, are liable to be constantly and largely precipitated in the bladder whenever any considerable portion of its lining membrane is the seat of suppurative inflammation. The soda of the liquor puris takes the acid away from these superphosphates, and the residual phosphates are thrown down at once, mostly in the form of an amorphous insoluble powder. Moreover, urine thus deprived of its normal acidity undergoes more promptly putrefactive fermentation, and the ammonia, always generated during this process, effects its peculiar reaction upon pus, when present, converting it into an adhesive, ropy, mucoid substance, a characteristic ingredient in the urine of so-called catarrh of the bladder, to which, indeed, that form of cystitis owes its name. Here we have at once two most important factors in the formation of vesical calculus.

The remarkable insolubility of lithic acid,[1] and of the neutral phosphates as well, are noteworthy facts in connection with the etiology of stone. The urates would rarely precipitate or crystallize at the temperature of the body, without a nucleus to invite them. The phosphates, by the aid of mucoid pus, do so more frequently; the large number of phosphatic calculi often found in the suppurating bladders of old people would seem to establish this fact. Whatever favors the generation of uric acid in the organism would seem, therefore, to serve in some degree as a cause of calculous disease. Gout and rheumatism, undoubtedly, do this. According to Prout, lithic acid is the essence of gout;[2] and gouty subjects are notoriously liable to gravel and calculous affections in all their forms. The occurrence of stone in the bladder, in successive generations in the same family, is thus explained. A tendency to excess of lithic acid belongs also to early life; it is one of the recognized peculiarities of infancy. Cases of congenital stone in the bladder are on record. The frequency of calculous disease in children is thus explained. In Thompson's table of 1,827 cases of lateral lithotomy, 473, or more than a quarter of the whole, were children under five years of age.[3] At the other end of life, obstructive disease, generally from enlarged prostate, is a frequent cause of stone in the bladder. The conditions are highly favorable to the formation of stone in a patient suffering from enlargement of the prostate; the change in shape which the bladder takes on, the catarrhal inflammation of its lining membrane, which almost inevitably sooner or later supervenes, together with the inability to completely evacuate its contents, whether from the obstruction at its outlet, or loss of contractile power, or both combined, all favor this result. These circumstances would seem to explain why vesical calculus is more frequently encountered at the two extremes of life. In Civiale's table of 5,376 cases of stone in the bladder, 2,314, or nearly one-half, were under the age of puberty—the largest number at any one year of life being 321 at five; while, of the remainder, the next highest number, 184, occurs at the age of sixty.[1] Inflammations affecting any portion of the mucous membrane lining the urinary passages would seem to favor the formation of calculous deposit. Stricture of the urethra, for this reason, and also from its obstructive influence, is a recognized cause of stone.[2] The influence of mineral ingredients in water habitually employed for drinking and cooking, is generally supposed to cause calculous disease; but of this there is no adequate proof. In certain regions of our country stone is very infrequent, as in New England;[3] while in Ohio, Kentucky, Tennessee, North Carolina, and Alabama, the disease is not uncommon. It is certainly very rare in the negro.[4] Without reference to race, the same unexplained tendency to calculous disease exists in certain localities in Europe, as in Norfolk, in England, Würtemberg, and Moscow; while in Denmark it would seem to be less frequent. There are no chemical or meteorological facts yet determined by science concerning either water, soil, or climate, which would justify an attempt to explain these discrepancies. Disease of the brain or spinal cord, paralyzing the lower extremities and bladder, favors the formation of stone. Here inflammation of the bladder, from stagnation and decomposition of the urine, is the immediate exciting cause. To what extent the coexistent diminution of nerve-power aids in the process is not so clear. There is little doubt but that the free use of animal food and malt liquor, coincidently with excessive fatigue and profuse sweating, is likely to cause a concentrated quality of urine prone to crystallize readily, especially in a healthy child, or in an adult of gouty habit; and it is not improbable that in a coincidence of favorable conditions of this kind many cases of stone take their origin. Civiale expresses the opinion that calculous disease in children not unfrequently dates from such sudden crystallization.

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[1] From the Greek λίθος, *a stone*.

[2] Prout on "Stomach and Renal Diseases."

[3] Thompson's "Practical Lithotomy and Lithotrity."

Foreign bodies introduced into the bladder, from without, become incrusted with the salts of the urine in an incredibly short space of time. A catheter left in the bladder will show deposit on its surface on removal at the end of forty-eight hours, and the incrusted material consists almost entirely of phosphatic salts. Stones which take their origin in this manner always increase rapidly in size, and they have been met with at all periods of life, except, perhaps, in very early childhood. The late war in this country furnished several examples of bullets, fragments of bombshells, etc., which had penetrated the bladder and become nuclei of stones. Pins, fragments of fish-bones, chicken-bones, and other articles swallowed as food or by accident, have found their way, by ulceration, from the intestines into the bladder, where they have given origin to calculi. Even fœtal bones have ulcerated into the bladder from the uterus, and pieces of wood and bone have been forced into the bladder as the result of accident; and, finally, through recto-vesical fistulæ, fruit-seeds, and other hard materials mingled with the contents of the bowel, have become nuclei of vesical incrustation. The most frequent cause of the presence of extraneous substances in the bladder is to be found, unfortunately, in the unnatural gratification of the sexual desire. It may be safely assumed that every material substance that could possibly enter the human urethra has been used for this purpose, and a certain proportion of articles so used have found their way into the bladder.[1]

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[1] "Traité de l'Affection calculeuse," Paris, 1838, p. 646.
[2] I have lithotomized two adults who were the subjects of stricture.—VAN BUREN.
[3] Morland, "Diseases of the Urinary Organs," Boston, 1858, p. 387.
[4] Gross on "Diseases of the Urinary Organs," Philadelphia, p. 343.

The short, direct, and capacious urethra of the female, which, by affording to nuclei formed in the body so ready an escape, renders stone in the bladder a rare disease in women, serves precisely an opposite purpose under these circumstances, so that in this class of cases the proportion of females is much larger, evidently because a foreign body can slip through the female urethra and be lost in the bladder much more readily than through the longer and more tortuous passage of the male. Hence, while in the aggregate we meet in practice but one case of vesical calculus in women to twenty in men, it may be confidently asserted that the proportion of cases, in which a calculus has formed on a foreign body introduced from without, is larger in women. There are several other forms of vesical calculus composed of materials existing only exceptionally in the urine, or in quantities so minute as to very rarely form concretions, such as cystine, xanthine, uric oxide, silicic acid, and carbonate of lime, for the study of which we must refer to works devoted specially to the chemistry of the urine.[2]

NUMBER, SHAPE, AND SIZE, WEIGHT, AND DEGREE OF HARDNESS.—Vesical calculi are usually solitary, of a compressed ovoidal shape, and in size varying from that of a large pea—just too large to escape by the urethra—to a magnitude limited only by the capacity of the bladder.

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[1] I removed a phosphatic calculus of large size, from a man of sixty-seven, at Bellevue Hospital, in 1847, which had formed upon a head of wheat-straw; and some years later I operated upon a boy of seventeen, at the New York Hospital, in the centre of whose calculus was found a piece of a slate-pencil, an inch and a half in length, which he confessed to have introduced into his urethra some years before, at school. Within the same year my colleague, the late Dr. John Watson, removed from a young man, at the same hospital, a phosphatic calculus of a shape so curiously elongated as to suggest an unusual nucleus. On section it was found to contain a piece of an ordinary lead-pencil, several inches in length. I have in my possession a phosphatic calculus, sent to me by my friend Dr. Taylor, of Memphis, Tenn., removed from a woman, in which the calculous matter is deposited around a fragment of althea-root, four inches in length, and converted into a brush at one end—an instrument used by a certain class of women for brushing the teeth with snuff—a practice not uncommon in some localities.—VAN BUREN.

[2] Neubauer and Vogel, "A Guide to the Qualitative and Quantitative Analysis of the Urine" (New Sydenham Society), London, 1863, and Thudichum, "Pathology of the Urine."

In weight and density they vary according to their chemical composition, the *weight* of a calculus conveying no accurate idea of its *volume*. The mulberry calculus, consisting of oxalate of lime, so called because the inequalities of its external surface sometimes resemble those of the fruit from which it is named, is the heaviest in proportion to its volume, the hardest, and most dense in structure; next in order of hardness and density is the calculus of pure uric acid; then the composite calculi, composed mainly of urates; finally, the lightest of all, and also the most friable, the phosphatic. The hardest stones are more apt to be solitary, and they are generally the smallest in size. These considerations are of practical value as bearing on the availability of the crushing operation, for there are some calculi of oxalate of lime, and even occasionally one of pure lithic acid, so dense and hard as to resist the strength and power of the best-constructed lithotrite. Mulberry calculi, nevertheless, vary in hardness, and Civiale reports several cases in which he crushed large calculi of this sort at one operation.[1] The length of time during which a patient may have suffered from symptoms of stone affords no positive evidence as to its size, nor is the reverse of this assertion true; for, as already stated, mulberry calculi and those of lithic acid grow slowly, and seem even to remain stationary for long periods, while those of compound character, and specially phosphatic calculi, gain size more steadily and rapidly. The last two varieties include the large majority of vesical calculi as encountered in practice; the stone, consisting of pure lithic acid, is met with perhaps once in eight or nine cases, while the mulberry calculus not once in twenty. In considering the size and hardness of vesical calculi, it is to be borne in mind that they are always lighter, harder, and even somewhat smaller after removal from the body, and thorough desiccation, than when saturated with urine in the bladder.

A calculus may be friable externally, while its nucleus may prove to be exceedingly dense and hard. For example: a patient may have carried a calculus of pure uric acid, or oxalate of lime, in his bladder for months, growing very slowly, and causing so little irritation as to scarcely trouble the transparency of his urine. Suddenly, from cold or other causes, the vesical irritation is increased; pus is formed; the phosphates are precipitated, and the calculus begins to grow rapidly from accretion of the more friable phosphatic salts. In crushing a calculus of this kind its fragments would naturally give evidence of different degrees of hardness.

As to multiple calculi, while a solitary stone is the rule, two may possibly be encountered in every six or eight cases as they occur in practice, and a larger number with increasing rarity. They are certainly more common in advanced life, but there are no known conditions upon which their presence may be predicated. Plurality of calculi would seem to result from the somewhat rapid and successive generation of renal nuclei and their transmission to the bladder, from the spontaneous fracture of calculi in the bladder, which occurs more frequently than is generally supposed; and from the influence of the bladder's contractions upon a soft magma, composed of earthy phosphates and altered mucoid pus, which is more or less constantly present in cases of chronic cystitis from prostatic or other obstruction.[1]

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[1] *Loc. cit.*, p. 193. Sir Henry Thompson also reports four calculi of oxalate of lime in 184 cases of stone treated by lithotrity, *British Medical Journal*, June, 1871, p. 571, and Ivánchich has recorded many others. Sechster Sammelbericht v. w. 50 Fällen v. Blasensteinzertrümmerung, Wien, 1873.

When their number is small they influence each other's shape, and grow to be many-sided rather than round or ovoid, the obvious result of mutual contact or friction, giving rise to flattened sides or facets. When a stone presenting this unusual form is removed by lithotomy, it suggests at once the probability of the presence of others in the bladder. If very numerous, on the contrary, and apparently just in proportion to their number, they tend to revert to the rounded form.

When a calculus varies from the common ovoid by unusual elongation in shape, it is suggestive of the presence of an exceptional nucleus—something introduced through the urethra. In calculi of this character the mass is ordinarily friable, being composed entirely of phosphates. At the same time this friability does not always justify the employment of lithotrity as a remedy, for the nucleus may be a substance which cannot be crushed, as in some of the instances already mentioned, and notably in the case of Henry Thompson, where a stick of sealing-wax was found in the centre of the mass, a substance which at the temperature of the body is quite soft.[2]

Vesical calculi present great variety as to roughness of surface. Sometimes as smooth as a well-worn pebble, they are generally rough, from crystalline deposits, and these asperities are in some cases exceedingly prominent and sharp. In very rare cases calculi assume fantastic shapes without any obvious cause. Occasionally the stone becomes fixed at the neck of the bladder, and from this situation it sends forward a prolongation into the prostatic urethra by which its shape is moulded.

In regard to the size of urinary calculi, very little more of practical value can be said here that does not come more properly under the heads of *diagnosis*, and *selection of mode of cure.* Surgical works on this subject teem with rare and curious cases of calculi, of great size and weight, the largest of which will be found to have been taken from dead bodies, and the next in size pretty uniformly to have brought about fatal results by their removal during life. It will always be necessary to refer to old authors for extravagant examples of this kind, for, in proportion as the means of relief which surgery can offer become more safe and sure, they will occur more rarely.

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[1] The influence of this latter cause of multiple calculi was happily illustrated in a case recently brought under my notice by Dr. Blake, of this city, of an old lady of eighty, who had suffered for a long time with procidentia of the uterus, in which the bladder was also involved. On repeated occasions, after retention of urine caused by their accumulation, she had discharged quantities of minute shot-like phosphatic calculi through the urethra, and after death the bladder contained hundreds of these little rounded masses, averaging about the size of No. 6 shot.—VAN BUREN.

[2] In a case reported by Dr. I. Porter, Jr., of Massachusetts, a phosphatic stone three and a half inches in length by one and three-quarters inch in width, and weighing three and a half ounces, was taken from a male after death. It was found to have been formed upon a stem of the *Archangelica purpurea*, two and a quarter inches in length.—*Boston Medical and Surgical Journal*, March 4, 1858.

POSSIBLE CONSEQUENCES OF STONE, INCLUDING SYMPTOMS AND PATHOLOGY.—Uneasy sensations, referable to the neck of the bladder, desire to pass water recurring with unusual frequency—both due to the strange impression upon the nerves of the organ, and generally ascribed to what is called "irritability"—are the first evidences of the presence of a foreign body in the bladder. When small and movable, as it usually is, the foreign body is liable to be carried by the flow of urine to the outlet of the bladder, and thus to cause sudden stoppage of the stream, accompanied by a twinge of sharp pain shooting along the course of the urethra, and felt most acutely at its outlet. The muscles at the neck of the bladder are thrown into spasmodic contractions by the presence of the foreign substance, and grasp it closely; if its surface is rough, the contact brings blood from the sensitive and vascular membrane, and this, when the spasm relaxes, is voided with increased difficulty with the next urine that flows. The neck of the bladder is its most sensitive part, and the recurrence of this rough contact sooner or later begets permanently exaggerated sensibility, together with increased vascularity —in other words, inflammation. Inflammation, under these circumstances, always begins at the neck of the bladder, and indeed may be for a long time confined to this locality; but it tends, sooner or later, to invade the body of the organ; and thus, as the stone grows in size, after a longer or shorter period of simple irritation, cystitis is established—brought about by prolonged repetition of mechanical violence, both from contact of the stone, and from the bruising by spasmodically excited muscles in the act of voiding urine, which is repeated with unnatural frequency and effort. Inflammation of the bladder from the presence of stone is always gradual in its approach, and chronic in its character. The healthy bladder is patient under violence, and slow to take on true inflammation, so that cystitis is chronic from the first; and, though liable to acute paroxysmal exacerbations, is essentially chronic in its manifestations throughout. During the first weeks or months of the stone's presence in the bladder, while as yet there is no cystitis, but irritation only, the urine remains clear and bright, showing only a slight increase of mucus, or of epithelial *débris*, and occasionally a little blood. The blood is more likely to be present after rough or violent exercise, or a jolting ride. But, after the beginning of cystitis, pus-corpuscles will always be found, generally in sufficient quantity to render the urine turbid to the eye, and always recognizable by the aid of a microscope.

Meanwhile the muscular coat of the bladder is taking on gradual hypertrophy from increased use, and its interlacing fibres begin to stand out in relief; while the irritated organ, intolerant of distention, discharges its contents at still shorter intervals, and thus a tendency to habitual contraction is established. The constant presence of pus in the urine occasions more rapid increase in the size of the stone from phosphatic precipitation, and the lining membrane of the bladder, now entirely involved in chronic inflammation, loses its normal tint of salmon pink, and becomes deep red, granular, or perhaps even villous, with occasional ecchymosis, and sometimes patches of yellowish surface-exudation. Most of the exudation, however, takes place in the sub-mucous web of connective tissue around the enlarged follicles, adding materially to the thickness of the bladder-walls.

It is a noticeable feature in the behavior of the bladder under irritation, that it has its periods of excitement and quiescence without any obvious cause, the inflammatory phenomena manifesting themselves by paroxysms rather than by steady progress, and thus justifying the old expression, "a fit of the stone." The varying conditions of the sexual organs—so closely associated with the bladder—may throw some light on this peculiarity, as may also the degree of nervous impressibility of the sufferer by irritating causes. Be this as it may, it is certain that the period of life between puberty and the sixtieth year, during which the sexual organs are active, is the period during which stone in the bladder is attended by the greatest amount of suffering, and the operations required for its relief by the greatest danger.

The time required to bring about the changes in the bladder above described varies greatly. A child may carry a calculus for years, and yet the urine remain bright and free from pus; in an adult, months may accomplish extensive alterations, but in advanced life, where the urinary organs are especially prone to take on morbid changes, and where, indeed, these may be already present as consequences of stricture, or enlarged prostate, it is fair to expect the most serious local results from the formation of stone. Here the advantage of diminished sexual excitability, and increased tolerance, is counterbalanced by the lack of vigor which belongs to age.

Preëxisting lesions of the obstructive sort in an old man may have already given rise to chronic cystitis, with contraction of the bladder, and thickening of its walls; or, as occurs not unfrequently from prostatic obstruction, the bladder may have given up the struggle to overcome the obstacle, and may have fallen into atony, with loss of contractile power and indefinite expansibility. The pain and suffering in the first of these two conditions are infinitely the greater, for the spasmodic contraction of the hypertrophied muscular walls of the bladder tends to grind the diseased mucous membrane against the newly-formed stone, often to force the stone into painful contact with the more sensitive neck, and thus add to the existing obstruction, and increase the difficulty and frequency with which the urine is voided. In the latter condition, the contractile element being absent, the patient is compelled to draw off his urine with a catheter, and is thus free from the constantly-recurring desire to urinate, with its accompanying spasms and tenesmus, and suffers, instead, a milder pain at longer intervals. It is worthy of notice how closely the muscular element in the bladder is connected with the pain of stone. It is a desideratum to be able to abolish it at will. At present we can accomplish this end only temporarily and imperfectly by opium, and (perhaps) in some degree by electricity.

In the complicated cases of vesical calculus which we are now considering, other changes in the bladder are liable to take place. Of these some are constant, others only occasional. Of the former, the most important is the local dilatation at its base—a sort of hollow or scooping out, which forms immediately behind the enlarged prostate, called by the French the "bas-fond" of the bladder. This becomes necessarily, both in the upright and horizontal positions of the body, the deepest as well as the most dependent portion of the cavity of the bladder, and it is therefore usually occupied by the stone, when present; and the stone is thus, in a measure, prevented from contact with the sensitive outlet of the bladder. The excavation of the *bas-fond* is often so considerable that an ordinary sound introduced into the bladder cannot be made to strike a calculus lodged here, the convexity of the instrument passing above it, and failure in diagnosis has often resulted from this cause. A sound with a short curve, like that of a lithotrite, so that its beak can be reversed in the cavity of the bladder, and swept across its base, is the instrument to be employed whenever the presence of stone is suspected, in conjunction with an enlarged prostate. Calculi may, and often do, form in the little pouches jutting out between the meshes of hypertrophied muscular fibres known as sacculi, and sometimes become so large as to be permanently entrapped in their cavities.

In the cases, and they are not infrequent, in which the bladder has lost its contractile power, unless the catheter be employed at regular intervals, the bladder is constantly in an overstretched, water-logged condition, relieving itself, irregularly and imperfectly, by spontaneous overflow. Civiale calls this "stagnation." Under these circumstances, and, indeed, whenever the outlet of the bladder is the seat of obstruction, the ureters, subjected also to over-distention, become dilated and tortuous; the inflammation of the mucous membrane of the bladder extends to and gradually involves their altered and weakened walls, and, continuing to extend, finally invades the pelves of the kidneys. The secreting structure of the kidneys, predisposed to disease by disturbance of functions, now soon participates in the advancing disorder, and functional disturbance, of serious import, attended by evidences of uræmic poisoning, foreshadows the fatal result which is imminent. This is, probably, the most usual course by which the end of life is reached in vesical calculus not interfered with by art, especially when associated with obstructive disease, i. e., stricture, or enlarged prostate. Ulceration of the chronically inflamed mucous membrane of the bladder occurs in a small proportion of cases. A few instances are on record in which calculi have worked their way out of the bladder thróugh ulcerations involving all of its coats, and have been ultimately found in the vagina, the perinæum, the umbilicus, and even in the groin. Urinary extravasation does not seem to have occurred in these cases, the whole process being apparently conservative, an effort on the part of Nature to get rid of the foreign body. Probably abscess in the thickened walls of the bladder, opening inward, first receives the calculus, which travels as the abscess burrows in search of an outlet. These conservative efforts of Nature are always of great interest to the surgeon, as they not only justify, but suggest the efforts of art in search of modes of cure. When death has occurred from stone, numerous small abscesses are often found in the thickened and altered walls of the bladder, and also in the substance of the kidneys. Multiple abscesses not unfrequently form in the enlarged prostate, and instances are not very rare in which the whole prostate has broken down into an abscess. Abscess outside of the bladder, in the neighborhood of its neck, from peri-cystitis, and pelvic cellulitis terminating in abscess, are complications of possible occurrence; and, in children where the peritonæum covers so much larger a proportion of the bladder-base than in the adult, both acute and chronic peritonitis have been encountered, not only caused by stone, but produced by operations for its relief, both with the knife and the lithotrite.

SYMPTOMS CONSIDERED IN RELATION TO DIAGNOSIS AND SELECTION OF MODE OF CURE.—The symptoms of stone in the bladder are pain, increased frequency of the desire to void urine, difficulty in the act of micturition, occasional presence of blood in the urine.

Pain.—As to the pain caused by stone, it is uncertain, variable, and capricious. Sometimes entirely wanting, it is not unfrequently constant and agonizing. In a majority of cases its principal seat is the neck of the bladder, extending along the course of the urethra; but it often will happen that a patient, when asked to fix the point of his greatest suffering, will indicate the under surface of the glans penis, just behind the frænum. This explains the tendency of most calculous patients of the male sex to habitually squeeze and rub this part, as this sort of manipulation seems evidently to dull the edge of extreme pain. Unhappily, young subjects are thus prone to acquire the habit of self-abuse. Children with stone habitually pull upon the prepuce, and its unnatural elongation is usually regarded as one of the signs of the disease. The rectum is a common seat of uneasy sensation, if not of acute pain; this is especially noticeable in prostatic cases, where there is a *bas-fond* for here the stone lies almost in contact with the walls of the lower bowel. When the bladder has become inflamed and altered, more or less dull pain is felt above the pubes, radiating to the hips, sacrum, thighs, and perinæum. The pain, in vesical calculus, is aggravated by motion, whether active or passive, and it is relieved by quiet and rest; especially by rest on the back with the hips raised. But the greatest pain of stone is usually felt in the act of passing water, and mainly toward the close of the act, when the bladder, empty of urine, grasps the stone with violence, and forces it against the sensitive orifice of the urethra, as if determined to eject it. Often a veritable spasm seems, in this crisis, to seize all the muscular tissues in the neighborhood of the outlet of the bladder. While suffering from this pain, the child, unrestrained by modesty, and giving full vent to his feelings, will grasp his genitals and dance around the room, howling with anguish.

In estimating the value and significance of pain, as a symptom of stone, it must be borne in mind that pain of a similar kind, although less in degree, is also present in cystitis of the neck of the bladder, from any cause, and also in simple nervous irritability of the neck of the bladder from sexual causes—"neuralgia of the vesical neck"—an affection too often ignored. In this latter condition the pain and frequency of voiding urine are sometimes greater than in actual inflammation. The sensibility to pain, or impressionability of the sufferer, is also to be taken into account, and, above all, the condition, of the genital organs, as to healthy innervation; for, unsatisfied sexual longings, and unnatural practices employed to gratify these longings, beget a peculiar hyperæsthesia of the genitals, in which the urinary organs largely share.

Misplaced sensations are sometimes caused by the chronic inflammation due to stone, or other cause, the more common expressions of pain being absent, as in Brodie's case, where a long-existing neuralgia of the foot was relieved by the discovery and cure of an old stricture of the urethra. Nor, finally, must it be forgotten that stones have been found in the bladder, after death, in persons who had given no evidence of the existence of the disease during life.

Increased frequency of desire to void urine is also a symptom of the diseases of the neck of the bladder, just enumerated, as well as of stone, and the pain in the act is also, as a rule, greatest at its close, just as the tender parts are grasped spasmodically by the extending muscles. But in stone this final, spasmodic pain is infinitely more acute, it lasts longer, and seems to be more apt to be mitigated by pressure at the head of the penis.

The presence of a little blood in the urine in conjunction with pain at the close of the act, especially after active exercise, or riding over a rough road, is very significant of stone; but this conjunction of symptoms is also occasionally present in other bladder, urethral, and kidney diseases. (*See* HÆMATURIA.)

Perhaps the most characteristic symptom of stone is the sudden arrest of the stream of urine while in full flow, accompanied by simultaneous spasmodic contractions of the muscles at the neck of the bladder, with coincident sharp and severe pain. This group of symptoms is produced by the falling of a movable body in the bladder, over the orifice of the urethra, so as to close it suddenly as by a ball-valve. In the rare case of a polypus, or of a prostatic tumor growing from within the neck, the tumor in either case being attached by a slender pedicle, the same phenomenon has been known to occur.[1]

It will thus be seen that, of the cardinal symptoms of stone, there is no one that is absolutely pathognomonic of the disease, and that clinical study and experience are necessary to the proper estimate of their significance. Study of the patient's habits, history, constitution and hereditary tendencies, will materially aid in forming a judgment as to probabilities. The same symptoms would possess a very different value before puberty, and after the age of forty; for, in childhood, all the diseases mentioned above as likely to be confounded with stone could be at once excluded, and the irritation caused by excessive acidity alone would remain to be considered.

In estimating the pathological condition of the urinary passages as affected by the presence of calculus, the microscopical and chemical examination of the urine must not be neglected. The existence of true inflammation can always, by this means, be distinguished from simple irritation by recognizing the presence of pus-globules in any quantity; and the character of these globules would seem to furnish some evidence as to whether they are the result of mere surface irritation, or of deeper and more serious lesions of tissue.[2] Pus in the urine may come from the secreting structure of the kidney, as when it assumes the form of tubular casts; from the pelvis of the kidney; from the ureters, bladder, or urethra; and, except in the case of casts, its source is to be distinguished mainly by the coexisting evidences of local lesions. In pus from the pelves of the kidneys the globules are free and not collected in masses, and the whole deposit is heavy, sinking rapidly to the bottom of the vessel, and often presenting to the naked eye a peculiar greasy appearance. Pain on pressure over the site of the kidney, or the presence of any unusual swelling or tumor in this locality will aid in recognizing pyelitis, which is almost invariably accompanied by more or less hectic and emaciation. Pus from the urethra is apt to assume the shape of floating thread-like filaments visible to the naked eye. These are washed from the surface of the urethra by the passing urine, rolled over and over, and thus spun into threads. Moreover, pus from the bladder can always be distinguished from that furnished by the urethra by collecting the urine which passes first and contains the washings of the urethra in a separate vessel, and comparing it with that which comes afterward.

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[1] Willis deposited in the Museum of the Royal College of Surgeons, London, a bladder taken from a man of sixty-seven, dead of cancer of the kidney, in which there was "a small polypoid body growing from its inner surface, directly over the orifice of the urethra, and covered by a shell or crust of the triple phosphate. . . . He had long suffered from occasional attacks of retention of urine and symptoms of stone. . . . Retention of urine was the urgent symptom of the case." It was always relieved by the introduction of a small flexible bougie, alongside of which the urine would escape. The bougie evidently pushed away the ball-valve, and was substituted for the catheter, as it answered the same purpose, with less irritation.—"Urinary Diseases and their Treatment," by Robert Willis, M. D., London, 1858, p. 284.

[2] "Quite normal pus-corpuscles of a perfectly circular outline, which, after treatment with acetic acid, exhibit the characteristic nucleus, composed mostly of two or three nucleoli, admit of the conclusion that the disease giving rise to their formation is of a mild form—a simple catarrh of the mucous membrane. But when the pus-corpuscles are irregular in form and outline, and on treatment with acetic acid show an irregular nucleus, or an indistinct granular mass in their interior, or when such corpuscles are mixed with irregular *débris*, not particularly defined, then purulent destruction is evident, and the integrity of the organ where this formation takes place is in great danger, or lost altogether. Such pus would be the product of ulceration and tuberculosis."—VOGEL, quoted by Thudichum, "Pathology of the Urine," London, 1858, p. 259.

A very common error in practice is to mistake the gelatinous mucoid material which results from the reaction in the bladder of ammonia upon pus for true mucus, and thus fail to recognize the existence of cystitis, perhaps already well established and extensive. The student of urinary diseases who will take the trouble to agitate in a test-tube a drachm of pure pus derived from any source with an equal quantity of aqua ammoniæ, and observe the result, will hardly fall into this error. True mucus, which is always present in healthy urine, collecting in a floating cloud of variable density as the urine cools, is furnished by the mucous follicles, which everywhere line the urinary passages. That furnished by the urethra is notably increased by erotic excitement. Mucus from the urinary passages proper is liable to be temporarily increased by greater density or more irritating quality of the urine; thus, the morning urine will always show a larger cloud of mucus. The presence of a foreign body in the bladder notably increases the amount of mucus in the urine. Pure mucus is always translucent, and its diagnosis may be established by the number of epithelial cells embedded in its substance. The mucus-corpuscle cannot be distinguished, singly, from the pus-corpuscle, and perhaps neither of them from a young epithelial cell; but, in mass, the difficulty ceases. The amount of mucus present in urine is rarely sufficiently large to lead to its being mistaken for gelatinoid pus. When there is any doubt, the habitual presence, in any considerable quantity, of pus-globules will readily settle the question in favor of the latter; gelatinous pus in any quantity, moreover, is never found, except when the urine is alkaline. It is generally associated, therefore, with the earthy phosphates; and, when the prismatic crystals of the triple phosphate of ammonia and magnesia are found embedded in it, the presence of ammonia, arising most probably from decomposition of urea, may be safely assumed. Finally, in cases where mucoid pus is largely present, the daily washing out of the bladder with tepid water will often restore the normal acidity of the urine, by removing the ammonia and other irritating causes, and, simultaneously with this change, the mucoid pus will disappear, to be replaced by a deposit of ordinary pus, usually diminished in quantity by the soothing influence of the fomentation. Attention to these facts will tend, in obscure cases, to facilitate the diagnosis of stone. The presence of the symptoms of vesical calculus which have been detailed, or of any of them, when their cause cannot be clearly made out after mature consideration, justifies a formal exploration of the interior of the bladder, by means of a sound. Such further examination, it should rather be said, becomes a duty; for the paramount importance to the patient of the early discovery of a stone in his bladder, in view simply of the comparative safety with which he can be relieved of a small stone before its presence has caused morbid change in the bladder, renders an early resort to the only certain test of its presence, an imperative obligation upon his surgeon.

Sounding.—The operation of sounding a patient for stone requires a light hand and gentle manipulation. It should not be resorted to during a "fit of the stone;" nor, if there be any suspicion of cancer of the bladder, without great circumspection, for severe hæmorrhage and aggravation of symptoms have followed in such event. Previous preparation is advisable in persons who suffer much, by rest, diluents, alkalies, if indicated, or possibly anodynes. In all serious cases a period of comparative quiescence of the symptoms should be chosen for the operation. An anæsthetic is required for adults, only exceptionally; for children it is desirable in the large majority of cases; and, as a matter of complaisance, perhaps, for women. The instrument should be of metal, with a short curve, like that of a lithotrite, and slightly bulbous at its beak. The "searcher" of Sir Henry Thompson (Fig. 76), the best sound in use at present, is capable of serving a double purpose; for it is hollow like a catheter, with an eye near its beak, and a metal plug fitted to its open end, so that the urine in the bladder can be drawn off, if in excess, or warm water injected, if necessary, during the operation. Mercier's "sonde coudée" has a different curve, and although not a catheter, is an excellent searcher (Fig. 77). The patient should lie on his back, with his hips slightly raised, on a firm bed or lounge, so placed that the operator may act from his right side, for the sound is

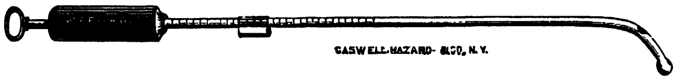

FIG. 76.

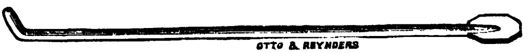

FIG. 77.

preferably introduced from this side, in order that the operator shall be in position to use his right hand most advantageously, and without changing sides when the sound shall have entered the bladder. The manipulation employed in introducing the sound is the same, with trifling modification, as that required for the lithotrite (Chapter XVI.). When in the bladder, the sound is to be pushed gently onward, until the posterior wall of the bladder is reached, when, withdrawing it slightly, its beak is to be turned carefully, first to one side, and then to the other, until the lateral wall or floor of the bladder is touched, by rotating its shaft between the thumb and finger; then it is withdrawn an inch—more or less—and the same manœuvre repeated; this is done again and again, if necessary, until the concavity of the sound comes in contact with the neck of the bladder, when it is withdrawn entirely. For a patient under middle age, this mode of examining with the sound would be adequate to the discovery of a calculus, if present, in a large majority of cases. Nevertheless, it is a safe rule of practice, never to decide the question after a first examination in which the result has been negative, but to ask for a second or even a third opportunity for search, before giving a positive opinion; and not to lose sight of the great advantages to be derived from ether or chloroform.[1] But, in a male patient over the age of forty, there is always a possibility that the bladder may have undergone a change in shape at its base—such as has been already described as forming a pouch behind the enlarged prostate—and here another manœuvre of great practical value is to be added to the operation. Instead of withdrawing the sound entirely, when its concavity has reached the neck of the bladder, as first directed, its beak is to be again carried forward to the centre of the bladder, and, the handle of the instrument being well depressed between the thighs, its beak is to be rotated by a complete half-turn of the shaft, so as to assume a reversed position and touch the floor of the bladder; keeping the handle of the sound sufficiently depressed to render its beak readily movable, this is now to be gently swept from side to side, as when it occupied the first position, and it will pretty certainly strike a calculus, if any be present, in a pouched *bas-fond* behind an enlarged prostate. The beak of the sound is then to be carried again to the centre of the bladder, with its handle still depressed, and restored to its first position by a half-rotation of the shaft of the instrument, and then carefully withdrawn. The whole operation should never exceed three minutes. When performed with due gentleness, it should cause but little pain, unless the patient is unusually sensitive, or the bladder in a state of acute inflammation. In the latter case, if delay be not admissible, the propriety of anæsthesia should be considered; for the condition of painlessness affords the operator undeniable advantages in attaining his object, although, with an unpractised hand, it possibly increases his liability to do harm.

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[1] Early in 1847 a boy of two and a half years was brought to me, with a history of great suffering, as from stone, since shortly after birth, but, although examined half a dozen times, none had been discovered. The little fellow struggled violently, and he was necessarily held by main force. As soon as the sound entered it, his bladder was seized by spasm and its contents forcibly discharged, and simultaneously the contents of the rectum also. The sound was so firmly grasped by the empty bladder that its beak could not be moved without force, and with great increase of outcry. Under these circumstances I bethought me of the new remedy which I had seen used a short time before by Morton, upon a patient of the late Valentine Mott, and brought it to bear upon my refractory patient. The result—with which we are now so familiar from daily use—was then novel, and it was wonderfully satisfactory. A small movable stone was struck by the sound almost as soon as it entered the relaxed and insensible bladder. A week later it was removed by the lateral operation, under ether, and a prompt recovery followed. The patient subsequently served creditably during the late war. I believe this to have been the first case of lithotomy with anæsthesia.—VAN BUREN.

It is desirable that there should be from three to six ounces of urine in the bladder when the sound is used, or, in other words, that the patient shall have retained his water from an hour and a half to three hours. If too full, a small stone is more likely to escape recognition; if the bladder contains less than three ounces, the sound is less easily manageable without rough contact with its walls. It happens sometimes, on the first contact of the beak of the sound with the walls of a sensitive bladder, that the organ is thrown into a state of spasm, and the urine forced out through the urethra, alongside of the shaft of the sound. When this accident occurs, it is better to defer the operation; or administer an anæsthetic, and, reintroducing the sound, inject through it four ounces of blood-warm water, and then proceed with the exploration.

If a calculus be struck shortly after the sound has entered the bladder, the operator has then a chance of forming at once some idea also of the condition of its walls, and of the size, roughness, and degree of hardness of the stone; for the sharp click of a hard stone is not difficult to distinguish from the muffled sensation received from a soft one, and, if the beak of the sound in contact with the stone is made to glide alongside of it by slow advance or withdrawal, a pretty accurate idea of its size, and of the degree of roughness of its surface, may be acquired.

After the operation of sounding, it is safer that the patient should have warmth applied to the hypogastrium and to the feet, and that he should keep his bed, at least for the remainder of the day; in short, he should be treated as after the use of the lithotrite.

Choice of Method of Cure.—When the presence of a stone in the bladder has been demonstrated, the questions at once present themselves: Can the patient be cured by the crushing operation? must he submit to lithotomy? or, is it more judicious to employ no surgical operation in the case, but simply to palliate symptoms by such medical treatment as may relieve from pain, and prolong life?

It may be safely assumed, in general terms, that a cure by operation may be undertaken in any case of stone in which the patient is not of extreme age, where the stone is not of unusual magnitude, and where the patient is free from evidence of any organic disease by which life is likely to be terminated within a limited period not very far distant. But we are compelled by the requirements of practice to reduce these questions to a narrower limit. Cases are constantly presenting themselves in which the patient's age is not extreme, and his general health sufficiently vigorous, but his stone so large that it can be removed only with the aid of the knife—by an operation the mortality of which modern science has not been able greatly to reduce. Here the judgment of the surgeon is to be guided by the following considerations: the degree of the patient's sufferings; the probable amount of relief to be expected from palliative measures, and the temper and circumstances of the patient, as measuring his probable capacity to properly care for himself, and command the comforts of an invalid. In the case of an old man able to command all the comforts of life, with a large stone, suffering only moderately, and able still further to lessen existing suffering by skillful care, it would be obviously the part of wisdom and humanity to hesitate in advising an operation. The simple fact that an operation can be done is no reason why it should be done in the face of very serious risk to life; and it is hardly necessary to say that the temptation to perform a capital operation, even at his urgent request, should never weigh for a moment against the best interests of the patient who places his life in our hands. The considerations which influenced Franklin and D'Alembert to decline lithotomy at the hands of Desault, at Paris, in 1784, still hold good, for the mortality of this operation has not diminished since the days of Cheselden.

Having determined, then, that it is proper, in certain cases, to decline an operation for stone, what course should be adopted after an examination has ascertained the presence in the bladder of a movable calculus of moderate dimensions? The amount of inconvenience caused by the operation of sounding should be observed, as indicating, in a general way, the condition of the bladder, and the measure of the patient's tolerance; and further exploration should be deferred until all increased trouble that may have been caused by it shall have subsided. Meanwhile the patient's history and present general condition should be carefully studied, and the vital organs subjected to physical exploration. Especial attention should be devoted to the kidneys and bladder, both by physical exploration, externally from the abdomen, the loins, and rectum, to detect tenderness on pressure, or tumor, and also by careful and repeated microscopical and chemical examinations of the urine. Much information will thus be obtained as to the condition of the bladder, the constitution of the urine, and an accurate idea of the size and state of the prostate. When the proper interval has elapsed a full-sized sound or bougie is to be introduced through the urethra for the purpose of testing the temper and capacity of this canal, and to detect the existence of stricture, if present. If the patient be sensitive, this may be repeated several times, at proper intervals, as it serves to diminish abnormal irritability of the urethra, often present from habitual contact of altered urine; to educate the passage, as it were, to tolerance of instruments; to familiarize the patient to his surgeon; and to lessen the nervous dread, which always exists in some degree, of his manipulations. If the urethra has been proved to be healthy, and of normal capacity; if the patient can retain his urine from one and a half to two hours, and is in fair general condition, the introduction of a lithotrite may be undertaken. Its object is to seize and measure the exact size of the stone; to ascertain, while the stone is in the grasp of the lithotrite, if there be any other stones present in the bladder (for it is only by this manœuvre that the presence of other calculi can be certainly demonstrated); to recognize any abnormal condition of the internal surface of the bladder, such as undue prominence of its muscular fasciculi, or possibly the existence of sacculi; and to determine with more accuracy the degree of tolerance of the organ, in view of the feasibility of lithotrity. An instrument of moderate size, and with perfectly smooth blades, should be selected for this operation, and it should be introduced, and managed, while in the bladder, in the manner hereafter described. The lithotrite should not be kept in the bladder longer than three minutes. If this exploration is satisfactorily accomplished, if the stone does not measure more than one and a half to two inches in diameter, is solitary, and the bladder has proved tolerant of the presence of the instrument, and of the whole proceeding, it may be safely concluded that the case is a proper one for the crushing operation.

Thus far the patient has been assumed to present conditions entirely favorable to lithotrity, viz., good general health, a tolerant bladder, a urethra of normal capacity, and a moderately soft stone, not more than an inch in diameter. But cases of this kind constitute but a small percentage of the aggregate encountered in practice. It is necessary that the surgeon should have an accurate perception of all the conditions that justify this mode of cure; and that he should be ready to reject, without hesitation, those cases which do not properly come within its scope. The choice of a mode of cure in a given case is not a matter to be decided by personal preference, or by partisan feeling—it must be determined entirely in the patient's interest, and after careful study of the case, especially in reference to the following points, which include the conditions usually presented, favorable or otherwise, to the crushing operation: the period of life; general or local disease, especially of bladder and urethra; degree of tolerance of instrumental manipulation; size and quality of the calculus.

A few words will be necessary on each of these points:

The *age* of the patient will determine the mode of cure in about one-half of the cases which present themselves in general practice; for the most reliable statistics teach that "one-half the entire number occurs before the thirteenth year is completed."[1] Now the limited proportions of the male urethra before puberty, the excessive sensibility of the child's bladder, and the want of docility and self-control at this time of life are all unfavorable to lithotrity; while it is just in this class of cases that the cutting operation has attained its greatest success—a mortality varying from one in eleven to one in twenty-eight, the mean mortality of the whole period of life, below the age of fourteen, being about one in fifteen. As a rule, then, to which exceptions are rare, lithotomy is the preferable method of cure for male children under the age of fourteen. The exceptions are, when the stone has been discovered just after its formation, while still very small, so that one or two operations with a slender lithotrite will certainly remove it. In these operations an anæsthetic would be required. In the future progress of lithotrity these exceptions may become more numerous.

In case of general disease, involving vital organs and threatening life, the performance of any surgical operation, with the object of removing a stone from the bladder, must necessarily be regarded as an exceptional proceeding, warranted only by the certainty of being able to remove immediate danger to life, or to relieve extreme pain, not otherwise relievable, with the prospect of prolonging life for a limited period. Where any operation is determined upon, under these circumstances, it would, probably, be more judicious to take the chances of securing relief at once, by lithotomy. An exception, here, would be a case in which there was great tolerance of the bladder, such as generally accompanies atony of that organ—a condition in which the practised lithotritist could do pretty much as he pleased.

By local disease of the urinary organs is understood, practically, stricture of the urethra, enlargement of the prostate, intense or persistent cystitis, and organic alteration of the kidneys.

The existence of confirmed organic stricture at one or more points of the urethra, is a serious impediment to lithotrity. A fully distensible canal, with healthy walls, is an indispensable requisite for the easy introduction of the instruments employed in crushing calculus, as well as for the ready escape of the detritus resulting from the operation. The question may be asked, Cannot the stricture be cured, and the patient afterward be subjected to lithotrity? The answer is, to restore the walls of a strictured urethra to their original suppleness, distensibility, and smoothness of surface, is a remote and rather uncertain possibility, if indeed it be a possibility; and the arrest of fragments at any point in the urethra where a stricture has once existed, is an accident always liable to occur. Yet there are instances on record in which this impediment has been overcome with more or less success; and a surgeon of tact and experience may, in a case entirely favorable in other respects, successfully compromise with this disadvantage when existing in a moderate degree.[1] In old cases of stricture, where stone has formed in the bladder, cystitis, of more or less intensity, is necessarily present; and here a resort to the knife is imperative—for an additional reason also, that, by a modification of median lithotomy, the stricture may be possibly treated successfully by external incision at the same time that the calculus is removed from the bladder.

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[1] Thompson, "Practical Lithotomy and Lithotrity."

CASE XXVII.—In 1869, a gentleman with an old and obstinate stricture, complicated with chronic cystitis, came to New York for relief. It was with difficulty that the smallest bougies could be introduced into the bladder. From the constantly-recurring exacerbations of intense pain in micturition, and the occasional presence of phosphatic sand in the urine, the suspicion arose that a stone had formed in the bladder. As the stricture was not amenable to treatment by dilatation, in consequence of the presence of false passages and extreme sensibility of the urethra, a very small whalebone bougie was introduced to serve as a guide, and, on this, division of the stricture was effected by perineal section; and the incision afterward prolonged to the neck of the bladder, whence were removed two phosphatic calculi of moderate size, which had been promptly discovered after division of the stricture. The patient made a good recovery, and learned to introduce for himself a full-sized steel sound, No. 17.

It would have been impossible to treat such a case by lithotrity.

Enlargement of the prostate is not an objection to lithotrity so long as it offers no obstacle to the ready passage of the necessary instruments into the bladder. Nor is the condition of atony, or impaired contractility of the bladder, so common a complication of the enlarged prostate, to be regarded as an unfavorable circumstance. On the contrary, it is in cases of this kind that the trained lithotritist is sometimes able to manage successfully the largest calculi removable by the crushing operation.

Chronic cystitis of a very intense and persistent character, *without stricture* or any obvious cause save the presence of the stone, is a valid objection against lithotrity. While the bladder is acutely intolerant of its contents, sufficient urine cannot accumulate within its cavity to afford an area in which the lithotrite can be safely manœuvred. Apart from the danger of still further increasing the intensity of the inflammation by interference, the simple attempt to introduce the instrument into the bladder is liable to bring on acute spasmodic contractions, by which its contents are forcibly ejected. Means must be employed, therefore, to lower the grade of the inflammation, to improve the quality of the urine, and to diminish the frequency of the calls to urinate, before the feasibility of lithotrity can be determined; and, if this improvement cannot be accomplished after a reasonable trial, the crushing operation must be abandoned. There is a wide margin here for skill and tact, in the employment of medical treatment to improve the condition of the bladder. When a degree of tolerance has been attained in which the intervals between the calls has reached an hour and a half, the contents of the bladder equaling about three ounces, and the improvement is progressive, then the use of instruments, in the gentlest manner, may be tried. Cases are on record in which, where the calculus has been small, and the patient otherwise healthy, the fact having been clearly established that the cystitis was being kept up solely by the stone's presence in the bladder, anæsthesia has been employed, and the calculus removed successfully at one operation. This is an exceptional application of lithotrity, justifiable only in the hands of a master of the art.

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[1] Walter J. Coulson, F. R. C. S., *op. cit.*, p. 52, *et seq.*, has cases illustrative of this point.

Long-continued obstructive disease of the urinary organs, either from urethral stricture or enlarged prostate, is often complicated, not only by chronic cystitis, but by deeper lesions, involving vital organs; dilated and tortuous ureters, evidences of chronic pyelitis of low grade, with atrophy and other profound alterations of the kidneys. During life, however, the existence of these serious complications cannot be made out with any absolute degree of certainty; habitual tenderness on deep pressure over the kidneys, tendency to chill on slight provocation, increased frequency of pulse toward evening, nausea and capricious appetite, with feeble digestion, and similar evidences of failing health, which cannot be otherwise adequately explained, are symptoms from which the existence of these lesions may be inferred. Any operation undertaken upon a person in this condition is liable to be followed by rapidly-fatal symptoms, due most probably to uræmia.

The form of renal degeneration known commonly as Bright's disease, a malady entirely different in its pathological signification from that sequence of morbid changes due to urinary obstruction which has just been described, seems, in fact, to be rather rarely associated with calculus disease. It often occurs in connection with cardiac lesion, and is readily recognizable by unmistakable symptoms, of which the most characteristic are the presence of albumen in the urine, and of casts of the uriniferous tubes in its sediment. When present, it constitutes a grave objection to operative interference of any kind.

What we require to know especially concerning the stone, in the next place, is its *size and degree of hardness;* or, if there be more than one, their aggregate volume, so that the amount of *débris* which would result from their crushing might be estimated with some approach to accuracy; and this knowledge, already attained in some degree by exploration with the lithotrite, is to be used conjointly with what has been learned as to the condition and degree of tolerance of the bladder; for the surgeon would be justified in attacking a much larger phosphatic calculus in the tolerant or atonized bladder of an old man, than one of uric acid of smaller size in the more irritable bladder of a younger subject. Again, a calculus of uric acid breaks into wedge-shaped fragments, with acute angles; and the mulberry calculus, from its extreme hardness, yields but few, and consequently large fragments, with very sharp edges; the result of a crushing in either case would involve more risk of subsequent inflammation than the less irritating and more pulverulent detritus of a phosphatic stone. It becomes obvious, therefore, that in fixing a rule which shall determine the choice between the crushing and cutting operations, as based upon the size of the stone, a standard must be adopted which shall vary with its quality. It is safe to say that all stones under an inch in diameter may be crushed; but it would not be judicious to conclude that all stones beyond this size must of necessity be reserved for lithotomy. Here is room for the exercise of sound judgment, and to this end an accurate diagnosis must be made as to the nature of the calculus, as well as to the condition of the bladder. For this purpose, careful microscopic study of the patient's urine, and inquiry as to when it first became turbid, and what changes it has undergone, will give much assistance. The habitual presence in the urinary sediment of the octahedral crystals of oxalate of lime, the prisms of the triple phosphate, of the common and varied crystals of uric acid, or of the purulent sediment of the amorphous urates, would add much certainly to the diagnosis of the probable nature of the calculus; while a close and searching inquiry into the history of the patient, his antecedents, his earlier symptoms, and their different phases as the malady progressed, the possible occurrence of previous attacks of renal colic, and the habits of the patient, as influencing them, with a review of his inherited or acquired constitutional peculiarities, could hardly fail to elicit valuable information.

The probability of a central nucleus of uric acid, from its extreme frequency, is very great; but the possibility of finding a nucleus in the shape of a foreign substance which had got into the bladder from without, such as a fragment of bone, or wood, which it would be impossible to crush, is not to be forgotten.[1]

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[1] In the collection of calculi in the Museum of the Royal College of Surgeons of London, according to the catalogue, out of 649 calculi, 212 are composed of uric acid alone; and, in 65 others, it forms the nucleus. Urates are given as constituting the entire calculi in 14, and the nucleus of 187 out of the 649; 13 are composed entirely of oxalate of lime; it forms the nucleus in 62.

In a successful case of lithotomy, which occurred in this city during the late war, under the care of Drs. Livingston and Markoe, a quadrangular fragment of bone was found in the centre of the calculus. It had been broken off by a bullet, which had passed completely through the bladder, leaving the piece of bone to become the nucleus of a stone. The size of this fragment was too great to permit its withdrawal through the urethra in the jaws of a lithotrite, and its consistence too solid and resisting to allow of its being crushed.

CHAPTER XV.

LITHOTRITY.

Preparatory Treatment.—Instruments required for the Operation, with the Manœuvres employed in using them.—Impaction of Fragments in the Urethra, with Methods of removing the same.

Lithotrity (*λίθος, a stone;* and *τειρω, to break*) is the name by which custom seems to have decided that the crushing operation shall be known. While it was yet a new enterprise, without an established position among the operations of surgery, many other designations were applied to it which have since passed out of use. Modern surgery has fully recognized the process by which it is proposed to reduce a stone in the bladder to powder, or, at least, to fragments so minute as to allow their free escape with the urine, and thus to remove it as thoroughly as by the knife—as the operation of lithotrity. It is only now, since its wide and successful employment by educated surgeons in all parts of the world, that lithotrity has been fully recognized as the mode by which a stone can be removed from the bladder, in proper cases, with the least risk to life. It has taken position, not as a rival of lithotomy, but as a new and additional resource by which the modern surgeon can cure stone in the bladder in a large proportion of cases, without incurring the well-recognized risks of the cutting operation.

This process of curing stone was first successfully accomplished by Civiale, of Paris, who operated before a committee of the French Academy appointed to report on the merits of the newly-invented operation, and cured his patient, in 1824. Before this it had been theoretically proposed to reduce a stone to fragments in the bladder, by Gruithausen, a Bavarian surgeon, by straight instruments, in 1813, with the purpose of subsequently acting upon them by solvents; and by Elderton, of Scotland, by a contrivance curved like a catheter and containing files, by which it could be ground to powder, in 1814; but to Civiale belongs the credit of first practically accomplishing this desirable result, and of effecting an undisputed cure of stone by a new operation. His earlier instruments and operative manœuvres have undergone great changes. These have been effected mainly by himself, by Amussat, Leroy d'Etiolles, and Heurteleup, on the Continent; and by Brodie, Crampton, Fergusson, and Thompson, in England. Charrière, of Paris, and Weiss, of London, the well-known surgical-instrument makers, have contributed greatly by their skill to the mechanical perfection of the instruments employed in the operation.

At first the instruments by which lithotrity was effected were inefficient, cumbersome, and in many respects defective; the operative manœuvres complicated, and unnecessarily severe and prolonged; the cases ill-chosen, and the success of the treatment frequently disputed. Ingenious men were attempting and testing new means and methods against an old enemy; the rivalry among them was not always free from petty and personal jealousies; nor was the conventional opposition to innovations against established usage devoid of bitterness and bigotry. But, considering the magnitude of the enterprise, the difficulties which attended its inception and early progress have been overcome with a steadiness and success worthy of the efforts of science in behalf of suffering humanity, and the result has added lustre to modern surgery. The efforts of the earlier lithotritists slowly but surely established certain great results, such as the necessity of patient study and diagnosis, with judicious selection of cases, careful preparatory treatment, deliberate and gentle manipulation, and short operations; and experience, growing steadily wider in its scope, has gradually settled most of the details of the operation, and created rules for the practice of the art which—at the end of half a century—are about as well established as those of any other department of surgery.

Preparatory Treatment, in its bearing upon the successful result of the crushing operation, can hardly be over-estimated as to its importance. Sir Benjamin Brodie's experience of 115 cases led him "to the conclusion that lithotrity, *if prudently and carefully performed, with a due attention to minute circumstances*, is liable to a smaller objection than almost any other of the capital operations of surgery."[1] The "attention to minute circumstances," emphasized by this honest and able surgeon, is especially applicable to the preliminary management and preparation of the patient for the operation.

At least ten days of rest—of freedom from all labor and anxiety attending ordinary pursuits—in the apartments to be occupied by the patient, is to be regarded as a necessary preliminary to lithotrity in the least unpromising case. This is essentially important for those who come to a large city from the country, a position in which, for obvious reasons, most patients will find themselves; and, for those seeking relief in the wards of a hospital, a period of acclimation is even more indispensable. The impatience of restraint, and the driving habits which characterize our countrymen, render it necessary to emphasize this point. A false estimate of time and the value of money will often prompt the patient to attempt to hurry his surgeon; but the enterprise is of too much moment to permit any sordid motive to endanger its favorable termination. In cases of a graver character this preliminary period of rest is still more important, and necessarily of longer duration.

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[1] "Notes on Lithotrity," Medico-Chirurgical Transactions, London, 1855, vol. xxxviii., p. 169.

In a healthy adult with a small calculus we should have to deal most probably with uric acid or its compounds, and here plain and simple diet, with lessened quantities of animal food, and increased allowance of fresh fruits and succulent vegetables, with half a drachm of citrate of potash, thrice daily, in plenty of carbonic-acid water or flaxseed-tea, would be a suitable regimen, calculated to counteract constitutional tendencies, to increase the quantity of the urine, and render its quality more mild and less acrid; and thus to diminish existing irritation of the bladder, and of all the urinary surfaces. Lying on the back, with the hips more or less raised, tends to keep the calculus out of contact with the neck of the badder, and this position has often a marked influence in lengthening the intervals between the calls to urinate—a result which it is especially desirable to favor. Meanwhile instruments are to be employed, at judicious intervals, with the object of completing diagnosis, and also for the purpose of gradually lessening the sensibility of the urethra to their contact. How often to introduce instruments into the urethra for this purpose is a delicate question; if the interval be too short there is danger of increasing the irritability we are striving to subdue, and this is an error not uncommonly committed. At first the interval should be longer—from three to five days—if the patient be very sensitive; the effect should be closely watched, and, if the operation is followed by no perceptible harm, the instrument may be used a day earlier each succeeding time. This is a matter in which tact must take the place of rules. In the majority of cases, perhaps, this desired result will be attained in a few days; but it is well to know that the most sensitive urethra may be trained to daily harmless contact with the lithotrite, if sufficient tact and patience are brought to the task. In very sensitive patients the soft French olivary bougie, anointed with cerate and then oiled, is to be employed at first; after this a conical steel sound, gradually increasing its size; then the metallic sound with a short curve; and, finally, the lithotrite.

For a case of more serious nature—of longer duration, with a larger stone, a bladder yielding more or less pus, and broken health from suffering and loss of rest—a longer period of preliminary treatment will be required. As already indicated, the treatment should include all measures likely to improve the general condition of the patient, as well as that of the urinary organs. Unremitting efforts to attain a more complete knowledge of the condition of the internal organs will bring to light evidences, probably, of more or less impaired digestion and nutrition, which should be met by appropriate dietetic suggestions: cod-liver oil, quinine, iron in some of its forms, are invaluable additions, under these circumstances, to well-selected and easily-digestible food. The patient's habit of body should be studied, and the natural and regular action of the bowels solicited by the simplest means. Active purgatives are to be avoided; they are liable to irritate the lower bowel, and to render the urine concentrated. Straining at stool is always injurious to a calculous patient; both the attitude and the effort tend to bring the stone into painful contact with the neck of the bladder. The mildest laxative, aided in its operation by an enema of warm water, in the horizontal position, and the use of a bed-pan, are preferable. While it is desirable to keep the urine copious and diluted, it is to be borne in mind that the too free use of diluents is liable, in some cases, to impair the tone of the stomach, and also to increase the frequency of urination.

The condition of the vital organs is to be scrupulously observed, and any evidences of lesion of the ureters and kidneys, noted carefully, as of serious import. Painful sensitiveness of the urethra is often kept up by the habitual contact of purulent and ammoniacal urine; it is desirable, therefore, in addition to the means employed to improve the general health, as soon as the urethra has proved tolerant of soft instruments, to make use of injections of tepid water into the bladder, pure or medicated, as often as they can be employed to advantage.

In this class of cases absolute rest is generally advisable; but sometimes, and especially where anodynes have been freely employed, the nervous irritability is greater in proportion than the local inflammatory lesions, and where this condition is suspected it would be well to try the effect of a daily walk in the fresh air—riding being more likely to increase the local pain. Where opium has become necessary from habitual use, it is better to manage it judiciously until after the operation, and then withhold it. The warm bath, or frictions to the skin by hand-rubbing, or hair mittens, is often of service. The patient should be distracted as much as possible from mental preoccupation with his condition, and he should be encouraged as to the future; there are no local diseases which so uniformly give rise to exaggerated mental depression as those of the urinary organs.

In the large and important class of cases of stone complicated with enlargement of the prostate, it is especially desirable to secure the entire docility of the patient. He is advanced in life; has already, perhaps, been compelled to learn to relieve himself by the catheter; may not, in fact, be able to empty his bladder without the instrument, in consequence of atony. He will probably, therefore, have notions of his own, and be hard to teach. Local explorations for the sake of diagnosis are to be conducted in such cases with extreme care and circumspection. In case of atony, if the patient is not already familiar with the manœuvre, it will be necessary to teach him to introduce a large-eyed evacuating catheter, through which to drain off the urine, and wash out the detritus, and this will be a task of little difficulty, for where atony exists there is usually great tolerance of the bladder—unless, indeed, the case be so far advanced in disease as to preclude all attempts at relief. If the atony is only discovered to exist when the patient first seeks advice, the surgeon will secure his entire confidence, readily and at once—for there is no condition in which more marked relief can be afforded than in this—by instructing the patient how to use the catheter for himself, and afterward employing vesical injections.

The nervous impressibility of calculous patients is usually so considerable, and the influence of fear, anxiety, and painful anticipation upon the action of the bladder is so marked, that it is good practice, when the patient is in condition to have his stone crushed, for his surgeon to give him no previous notice of the fact, but to introduce the lithotrite as on previous visits—where it was done for exploration—to seize the stone, if it should lie favorably, and crush it without further ceremony.

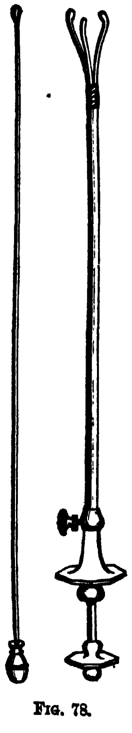


FIG. 78.

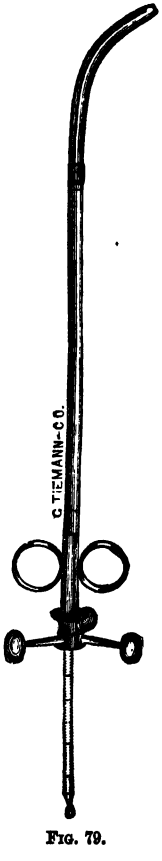


FIG. 79.

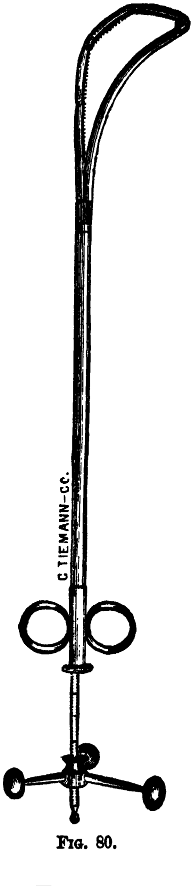


FIG. 80.

INSTRUMENTS REQUIRED FOR THE OPERATION.—The surgeon who would master the art of lithotrity must make himself thoroughly familiar with the construction and qualities of the instruments which have been contrived with the object of reducing a stone in the bladder to powder. The lithotrite is the perfected result of many trials, and of the correction of faults, as found out by experience, in instruments previously invented, modified, and thrown aside. Amussat and Key had recently established the fact that straight instruments could be passed through the urethra into the bladder with a certain degree of facility, and for this reason, apparently, the earlier efforts to bring a perforating, grinding, or triturating power to bear upon the stone were made by Civiale and his followers, with straight instruments. This surgeon made his first great success with his "litholabe"—a straight instrument—and for ten years no other than straight instruments were used for lithotrity. The "trilabe"—also known as Hunter's forceps (Fig. 78)—is still occasionally employed to catch last fragments, and in case of impaction of a fragment in the urethra. About the year 1834 the articulated lithotrite of Jacobson (Figs. 79, 80), and the curved lithotrite, with jaws

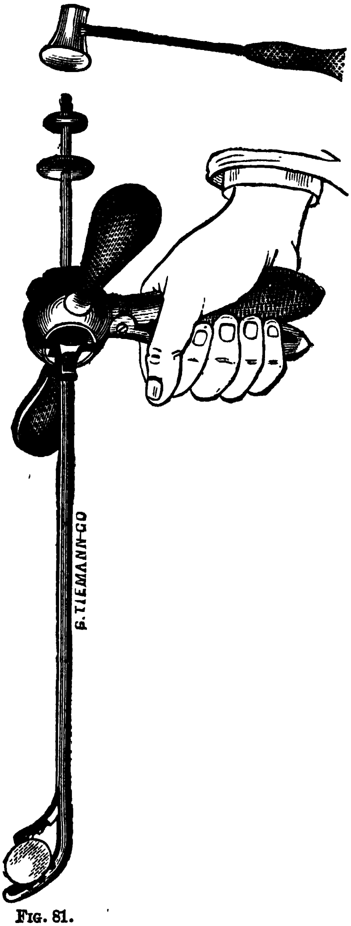


Fig. 81.

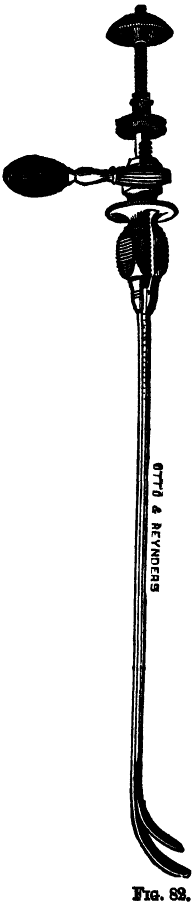


Fig. 82.

to open and shut, devised by Weiss, of London, began to be substituted for the "trilabe," and Heurteloup so modified this latter invention that percussion, by means of a hammer applied to the free extremity of its movable or male blade (Fig. 81), could be brought to bear upon the stone. Heurteloup also used a table to which the patient was strapped, so constructed that the position of his whole body, and consequently of the stone in the bladder, could be changed at will, thereby placing it in the surgeon's power to bring the stone within the grasp of the jaws of the instrument, without moving the latter. This mode of operating, though effective in the hands of its inventor, was soon discarded as too cumbersome, and the use of the hammer and percussion has been gradually superseded by lever-power, in the form of the rack and pinion, and of the screw. The rack and pinion was first adapted to Weiss's curved instrument by Sir William Fergusson, in 1834 (Fig. 82). By this mechanism a certain jerking impulse may be added to the crushing force which it exercises upon a hard stone, resembling in some degree that of the percussion-hammer. The lever-power in Fergusson's instrument is necessarily regulated by the diameter of the handle, by means of which the force is applied, and the strength of the operator's hand.

It is worthy of remark that the use of the screw, first proposed, in 1824, by Weiss to Sir Benjamin Brodie, was rejected through fear of violence to the walls of the bladder from the explosive force with which fragments of stone were scattered by it, the difference in this respect, between cracking a dry stone in the air and one sodden with moisture in a fluid medium, not having been correctly estimated. This fear has been proved by experience to have little foundation. Yet, although actually employed by Hodgson, in the Birmingham Hospital, in 1825, the screw did not come into general use until ten years later, after the rack and pinion had been proved to be both harmless and efficient. The greater efficiency of the screw as a power, and the ease and smoothness of its application. by the mechanism now in use, have led to its very general adoption.

It is well for the beginner to select a certain form of instrument, and always use it; he will thus gain the advantage that comes from familiarity.

In a recent report from Sir Henry Thompson, of one hundred and eighty-four consecutive cases of lithotrity, he states that he employed in this wide range of operative experience—which must have embraced all the varieties of calculous disease properly remediable by the crushing operation—but two lithotrites, a stronger instrument for first crushings, and another, with plain blades, for reducing the fragments to powder. These instruments, known by his name (Fig. 83), are at the present time very generally in favor, and with justice, for the perfection of their construction leaves little to be desired. French lithotrites (Fig. 84), which have essentially the same construction, with slight differences in detail, may be possibly superior in finish; but, where the full power of the crushing instrument is wanted, the English steel is more reliable. A less practised operator would probably require also a third lithotrite, with broader, shorter, and entirely smooth, plain blades or jaws for finding last fragments and making explorations and measurements. Formerly, when it was thought desirable to bring away as much as possible of the detritus of the crushed calculus between its jaws, this style of instrument was known as the scoop-lithotrite (Fig. 82). At the present time this is not considered good practice, as it exposes the neck of the bladder and the urethra to risk of injury.

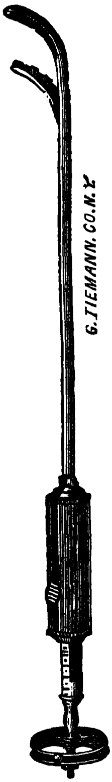


FIG. 83.

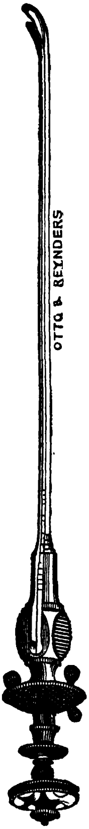


FIG. 84.

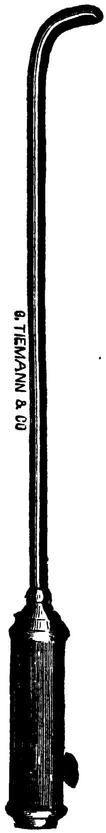


FIG. 85.

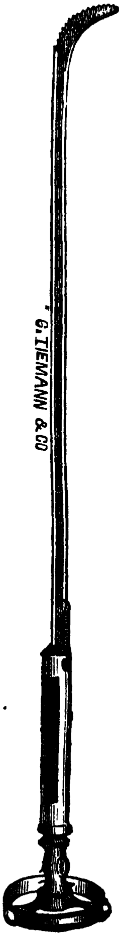


FIG. 86.

In describing a lithotrite, we speak of its "handle," "shaft," and "beak," or short-curved extremity. The point at which the beak joins the shaft of the instrument is its "angle," and this should be somewhat greater than a right angle, but not exceeding 120°, as, beyond this, power would be sacrificed to facility of introduction. Regarding the lithotrite as a sort of sliding forceps, we recognize a "female" (Fig. 85) and a "male" blade (Fig. 86), the former larger, heavier, forming the greater proportion of the instrument at its beak and shaft, which is deeply grooved for the reception of the male blade; the latter, called by some the sliding-rod, more slender, but carrying the screw at its handle, is intended to move backward and forward in the groove of the female blade, and here the finish should be perfect, in order to avoid friction. When the male blade is pushed forward as far as it will go—pushed home—the beak of the lithotrite is closed and solid; as it is moved backward, or withdrawn, the jaws of the instrument are in the same degree opened. A measuring scale marked on the front of the handle of the lithotrite indicates, with exactness, the extent of this opening.

The jaws of a lithotrite vary in strength and structure in accordance with the work required of them. For the exertion of the greatest degree of crushing power, as when brought to bear upon a stone of size and hardness, the jaw at the end of the male blade is narrow and fashioned into deep and sharp angular teeth, while its fellow is broad, heavy, and "fenestrated" (Fig. 87); that is, furnished with a longitudinal slit, or window, at its centre, through which detritus and fragments are forced, as the jaws are closed, thus preventing clogging, or impaction. These jaws are also of as great length as the necessity of their being worked in the limited cavity of the bladder will permit. Hence the calculus upon which their teeth cannot be firmly fixed may be fairly regarded as beyond the reach of the crushing operation.

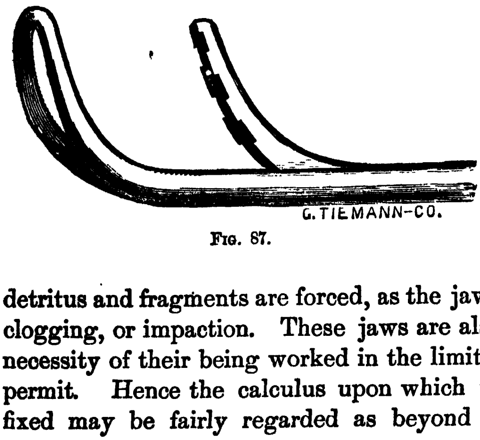


FIG. 87.

Where less power is required, as in crushing small or soft calculi, or in pulverizing fragments, the jaws of the lithotrite are shorter, and less heavy, and their opposing surfaces are simply roughened (Fig. 86). With this instrument, Sir Henry Thompson tells us, he does nine-tenths of the work. In the so-called "scoop" lithotrite, the extremity of the female blade is excavated into a shallow, spoon-like cavity, and both jaws are short and smooth. In the two latter instruments there is a small opening at the angle of the female blade for the escape of detritus; and the angle of the male blade, in all of them, is purposely made its point of least strength, so that if fracture should possibly occur, it must take place at this point, and the resulting fragment be small and easily removable.

The "beak" of the lithotrite, in all forms of the instrument, should be perfectly smooth and well rounded externally, the jaws of the female blade being in all cases wider, so as to receive that of the male blade into its cavity; and the edges of each carefully beveled, so as to offer the least possible chance of catching a fold of mucous membrane between them as they come together.

The "male blade" can be readily detached from its fellow, for the purpose of cleaning the instrument. In its handle is lodged the power, an endless screw, worked by a wheel which forms a part of it (Fig. 86). The "female blade," in the English instrument, is furnished with a fluted cylinder at its handle, for convenience of manipulation (Fig. 82). Here we find a button (Fig. 87, *bis*), connected with a small cog consisting of a few threads of a female screw movable by applying a thumb to the button, and so constructed that, by this simple movement, it can be thrown into or out of connection with the endless screw in the handle of the male blade. By this simple and ingenious mechanical contrivance, a power is held in reserve which may at any moment be brought to bear upon an object grasped between the jaws of the lithotrite. In the original instrument of Weiss, the screw was worked by hand like a gimlet, and, when screwed home, and the stone or fragment crushed, it was necessary to unscrew it again by the same slow movement, before its jaws could be opened sufficiently to grasp another fragment. The contrivance at present in use was devised by Charrière, the ingenious surgical-instrument maker of Paris, and is called by the French the "écrou brisée." In the French lithotrite the screw-power is thrown in and out of gear by a quarter-turn of a movable disk, attached to the handle of the female blade, and this takes the place of the button-trigger of the English instrument.

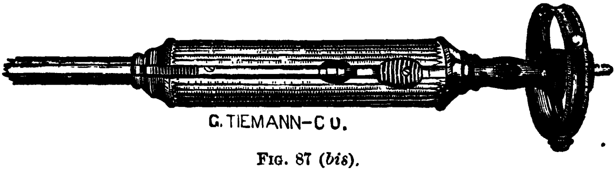


FIG. 87 (*bis*).

In studying the instruments employed in lithotrity it must be borne in mind that the object of the operation is to reduce a stone to powder, with the least possible risk to the bladder or urethra. This risk comes from contact of the necessary instruments, and of fragments of stone as they escape. In the construction of the modern lithotrite, the avoidance of injury by contact has been kept scrupulously in view, while preserving enough strength to accomplish its purpose. Hence its greater lightness as at present used; the force of contact is materially diminished. The beveling of the edges of the jaws of the lithotrite, to prevent nipping of the mucous lining of the bladder, the slenderness of its shaft, to obviate friction against the walls of the urethra, and its general smoothness and accuracy of finish, all conduce to this general object. It is obvious that, the greater the power of the instrument, the greater the risk to the bladder. For this reason the heavier lithotrite is resorted to only in case of absolute necessity, almost all the work being accomplished by the lighter one. When a stone or fragment is seized by one of these, and its power proves insufficient, the stone will slip from the grasp of the instrument; the comparative smoothness of its jaws favors this result. In the rare cases where too hard a stone is fairly between the dentated jaws of the lithotrite of greatest power, the operator will distinctly recognize the recoil and spring of his instrument as he turns the screw, and he must use his tact and judgment in not urging it too far. Yet, cases in which a lithotrite has broken in the bladder are singularly infrequent, especially so since lithotrity with modern instruments has been so generally employed.

It will be evident, from what has been said, that the lithotrites of the present day are designed to crush calculi in the bladder, and to reduce their fragments to coarse powder, so that the *débris* thus produced may readily pass with the urine. Formerly it was a part of the operation to remove the *débris* after crushing, and scoop-lithotrites, made especially for this purpose, were employed. As experience has increased, it has come to be regarded as a principle essential to the success of the crushing operation to avoid officiousness in the use of instruments, and to trust as much as possible to the efforts of Nature. Hence the surgeon confines his efforts to thoroughly reducing the calculus to powder, and confidently leaves the result to the expulsive power of the bladder—which experience has shown to be fully adequate to this end.

There are cases, however, in which the tolerant condition of the bladder invites lithotrity, but where the bladder's contractile and expulsive power is defective; where an obstruction or dam has been formed at its outlet by an enlarged prostate; or where both of these disabilities coexist. Here, if the patient has already learned to pass a catheter for himself, an instrument—flexible, or of silver—of larger calibre and with larger eyes may be substituted for that in ordinary use, and, if sufficiently docile, he may be taught to wash out his bladder with tepid water (p. 196). Otherwise, after the stone has been crushed, the evacuating catheter (Fig. 88) must be employed by the surgeon. This instrument is made, preferably, of polished iron, of as large calibre as the urethra will admit, with a large, oval opening at its convexity, and provided with a jointed stylet (*a*), terminating in a roughened head—by means of which a fragment, accidentally lodged in the instrument or at its eye, may be promptly crushed or forced back into the bladder, if the current of water should prove insufficient to dislodge it. The caoutchouc bag (*b*) is better than any form of syringe; it can be used with one hand, by the patient himself, and with less risk of violence to the bladder.

There is a certain advantage in teaching a patient to use instruments for himself; where atony exists, this *must* be done sooner or later, and the sooner the better. But, if time presses, or the patient be slow in learning, it may be necessary for the surgeon to act, and, in any case, he should lead the way.

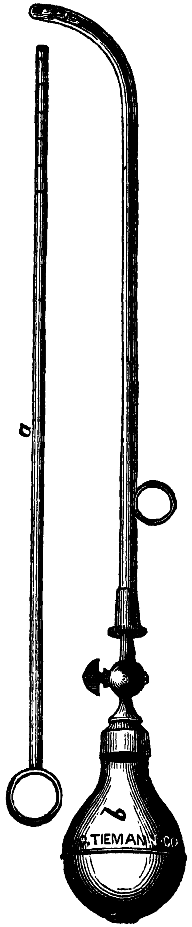


FIG. 88.

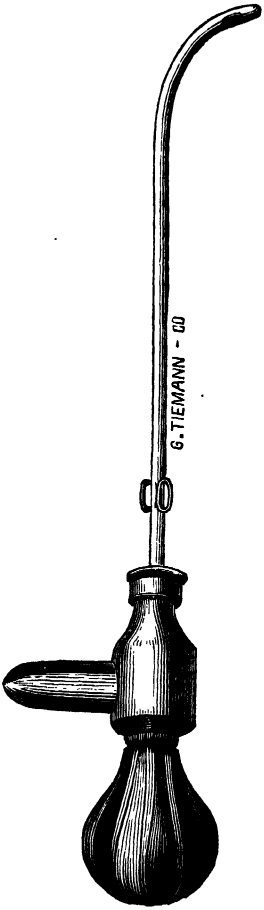


FIG. 89.

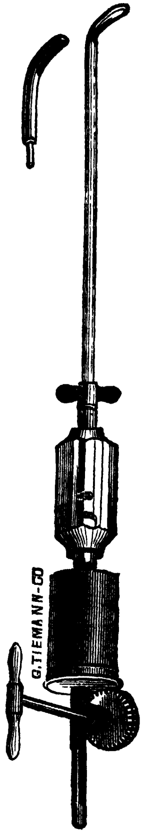


FIG. 90.

The evacuating catheter is better introduced while the patient is on his back, and a little tepid water thrown in—a four-ounce bagful, if the bladder will receive it. Then let him get into the upright position and lean a little forward, while as much more water is injected as will bring on a slight sensation of distention, or desire to urinate ; at this moment withdraw the catheter a very little, so that its eye is just at the outlet of the bladder, and then disengage the nozzle of the injecting-bag and let the water escape. If gently managed, this manœuvre can be repeated several times without too much fatigue to the patient, or to his bladder, and it is the most effectual method of getting rid of the *débris* of a stone, where the bladder cannot act for itself.

There are other modes of accomplishing the object, which may be employed where the patient is unable to assume the upright position, or where it has been thought better to operate under the influence of an anæsthetic. Clover's apparatus (Fig. 89) consists of a large-eyed metallic catheter, such as has been described, to the nozzle of which a powerful sucking-bottle of caoutchouc, with a cylindrical reservoir of glass at its neck, is adapted. This has been modified in Paris by substituting an exhausting-pump for the caoutchouc bag (Fig. 90). There is some danger, when suction is employed, of drawing the mucous membrane of the bladder into the eye of the catheter. The ordinary enema or self-injecting apparatus of caoutchouc, with a glass reservoir let into the tubing at a short distance from its nozzle, is also of practical utility. Additional tubing can be added, if desired, to any length. The fragments can be seen collecting in the transparent reservoir, while the supernatant fluid is thrown back into the bladder.

Before finally withdrawing the evacuating catheter, the patient should be again in the horizontal position, and, the instrument being advanced a little farther into the cavity of the bladder, the pointed stylet should be reintroduced. This precaution is necessary, in order to get rid of a fragment possibly impacted in the eye of the catheter, which might cause laceration in withdrawal, as well as to close this large opening, the edges of which would be liable to occasion a similar accident.

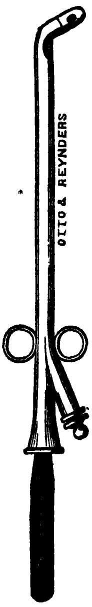


FIG. 91.

The double catheters employed for washing out the bladder by a continuous current are not suitable for the present purpose. The channel of exit cannot be made large enough to serve efficiently in the evacuation of *débris* without increasing the diameter of the instrument beyond a convenient size. The best of them, that of Mercier, of Paris (Fig. 91), has this fault. There are conditions, however, in which such an instrument might render service.

The large opening or eye at the beak of the evacuating catheter is made, in some instruments, at either, or on both sides, at its concavity or convexity.

In the use of all evacuating catheters it is well to exercise caution as to over-distention of the bladder by the injected fluid, especially in a patient who is insensible. Fluids under pressure transmit force equally in every direction, and in much greater degree than seems probable to one who has not given especial attention to this point. Moreover, it is one of the objections to lithotrity that it leaves the bladder with a tendency to atony, and this is a condition readily produced, or aggravated, if already existing.

Whenever it is feasible, the urine passed after the crushing operation has been performed, or the washings of the bladder—if artificial evacuation has been effected—should be passed through a strainer, and this should be provided before crushing. A piece of muslin, substituted for the perforated bottom of an ordinary tin colander, and kept in place by a movable ring or band slipped on its projecting bottom rim, makes a very good strainer. Such a contrivance may be placed upon an ordinary chamber-vessel, and so used; or, if the patient passes his urine while in bed, the contents of his urinal should be poured upon the strainer, so that all detritus escaping from the bladder shall be surely collected.

IMPACTION OF A FRAGMENT IN THE URETHRA.—A fragment of the crushed calculus may lodge in the urethra, and require surgical aid to effect its removal. This accident, formerly not infrequent, and greatly feared, occurs rarely in modern practice. Its frequency in the early history of lithotrity—Leroy d'Etiolles says it is to be expected once in every four cases—was due to the impatient desire to see the immediate effect of the operation, which led to early and unrestrained efforts at voiding urine to get rid of the result of the crushing. The surgeon, also, considered it his duty to bring away as much as possible of the crushed stone between the jaws of his lithotrite, after each operation—a frequent cause of abrasion and laceration of the lining membrane of the urethra, producing, naturally, an irritable condition of the muscular tissue surrounding it, and a tendency to spasmodic contraction. Such a condition would greatly favor the arrest and impaction of a sharp angular fragment, or even of a round or smooth one, which, in a healthy urethra, would find its way out readily. At the present day, every precaution is taken to avoid injury to the urethra, and the patient is not allowed to pass water in the upright position for at least twenty-four hours after an operation of lithotrity. Moreover, the surgeon makes it a point to pulverize the fragments of the stone as thoroughly as possible, and the improved construction of his instruments enables him to do this without fatigue or injury to the bladder. Yet, the accident will occasionally happen, and it is well to keep the possibility of its occurrence in view under the following circumstances: when operating upon young and irritable subjects; whenever uncontrollable spasm of the bladder comes on, as it sometimes does, after a crushing; and, especially, when stricture, or any lesion of the urethra, has existed.

The varying dimensions of the urethral canal explain why impaction of a fragment occurs, almost of necessity, at certain points where it is narrowest, viz.: at its membranous portion just behind the hole in the triangular ligament, where also the presence of the cut-off muscular fibres especially invites the accident; at the middle of the spongy portion, where the urethra, after its enlargement opposite to the bulb, has again gradually diminished in calibre; and, finally, just within the external meatus.

At each of these points the removal of an impacted fragment calls for a different surgical manœuvre. If lodged in the bladder-side of the opening in the triangular ligament, or in the grasp of the "*cut-off*" muscles, it is to be gently pushed back again into the bladder. This has been effected most frequently, perhaps, by the introduction of an ordinary full-sized catheter; but the following is more perfectly adapted to the purpose, namely, a metallic catheter of the largest size, with an open end, containing a bulbous stylet that fills the open end during

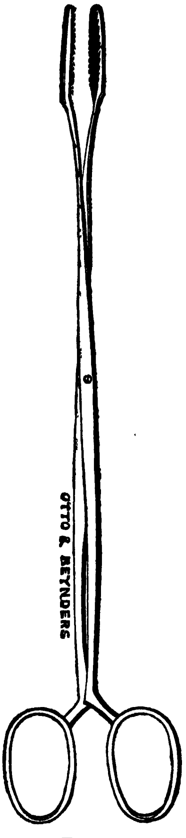


FIG. 92.

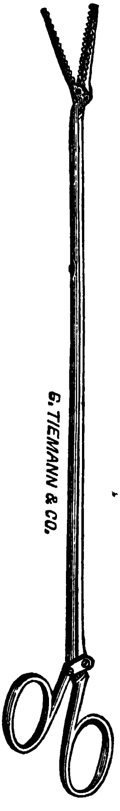


FIG. 93.

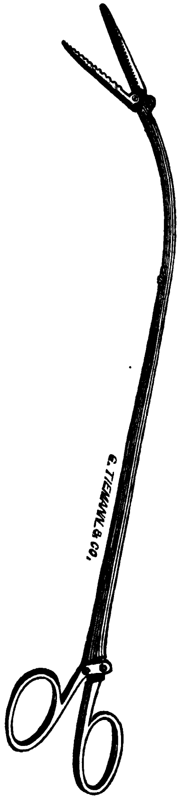
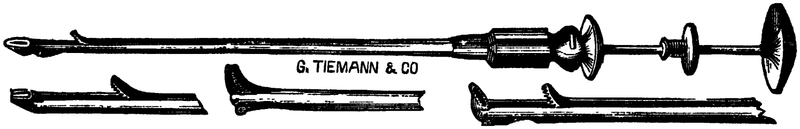


FIG. 94.

introduction, and when in contact with the calculus can be withdrawn, so as to leave a cup-like cavity, with rounded edges, to inclose the fragment more or less completely. Should the fragment prove to be immovable without the use of force, which must always be avoided, the injection through the catheter of water, olive-oil, or flaxseed-tea, as warm as can be borne, will aid the manœuvre. When a fragment has freed the opening in the triangular ligament, and has lodged at a point in front of it, an attempt to push it back into the bladder is not advisable. The proper course now is to withdraw it through the meatus. For this purpose a variety of instruments have been devised, their number suggesting the idea that the proceeding is not devoid of difficulty; and, in view of the danger of laceration of the urethra, this is not without truth. The best of these instruments is the simple, long, urethral forceps (Figs. 92, 93, 94) in one of its forms.



A. FIG. 95. *B.*

The instrument represented (at Fig. 93) has one solid blade, while Fig. 94 is jointed so as to work by double lever. The former is more efficient. Ordinary urethral forceps (Fig. 92) should always have long, slender blades, with spoon-shaped jaws, slightly roughened on the concavity, and handles that cross each other, so as to prevent over-distention of the meatus when the jaws are opened. The flat, jointed, urethral scoop of Leroy d'Etiolles (Fig. 95) still remains in favor. It is introduced, open (*A*), a little beyond the fragment, and then, by turning a screw at its handle, the little spoon-shaped beak is gradually brought to a right angle with the shaft (*B*). Although this ingenious instrument has a certain degree of efficiency, yet, as the walls of the urethra are not protected by it from contact with the rough surface of the fragment, abrasion will almost certainly occur as the latter is being withdrawn. This liability is best avoided by crushing the fragment in the

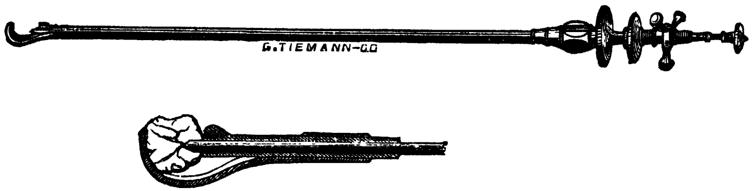


FIG. 96.

urethra, and for this purpose delicate lithotrites have been constructed; but they all expose the walls of the urethra to danger, and are, practically, unsafe instruments. The best of them is the "brise-pierre uréthral" (Fig. 96) of Reliquet. This instrument can be used as a delicate, hook-like scoop, which is to be inserted behind the fragment, by appropriate manipulation. When this is accomplished, a stylet contained in the male blade is pushed down upon the fragment, to fix it in position. If, now, the fragment cannot be withdrawn without force, a tube, with sharp teeth at its extremity, which slides upon the stylet, is brought to bear upon the fragment, and it is reduced to powder, by turning a screw at the handle of the instrument, and also by rotating the stylet, which acts as a perforator. The male blade, which consists of this hollow tube and its contained stylet, is furnished with a rounded lateral process near its toothed extremity, which serves to push aside the urethral walls, and save them from injury during the crushing. The stylet may be withdrawn entirely, and warm water injected into the urethra to wash away detritus, if necessary.

To get the scoop behind the fragment, let an assistant compress the urethra just beyond it to prevent the convexity of the scoop from pushing it back into the bladder, and then, by bending the penis to a right angle, or even beyond, and at the same time pushing the convexity of the scoop against the lateral wall of the urethra, the beak of the instrument can be inserted between the latter and the fragment which, by a spooning movement, is scooped into its concavity (Fig. 97). Next to this instrument, in safety and efficiency, is the straight "trilabe," or three-bladed lithotrite, used by Civiale, originally employed by John Hunter (Fig. 78). Its mode of use hardly requires description. A simple loop of wire, in the absence of other instruments, may be improvised successfully; and, in any case, this contrivance might be useful in aiding to alter the position of the fragment, so as to bring it within the grasp of the forceps.

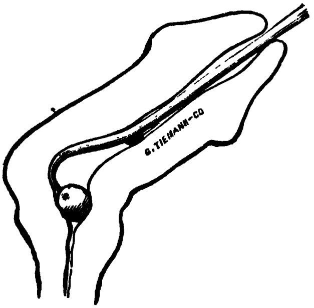


FIG. 97.

When the point of arrest of the fragment is found to be just within the orifice of the urethra, or in the fossa navicularis—a form of the accident that occurs most frequently in children, in whom the expulsive power is great, and used without restraint—it is generally advisable at once to enlarge the orifice, with a delicate bistoury, or Civiale's meatotome (Fig. 43).

There are cases of impaction in which the fragment is small enough to pass readily under ordinary circumstances, but is held in place solely by *spasmodic* contraction, so readily provoked in an irritable or unsound urethra. In such a case, if a very small bougie can be insinuated beside the fragment into the bladder, and left in place a few hours, its presence will often quiet the spasm, and lead to the spontaneous evacuation of the fragment. In any event this manœuvre will tend to relieve retention, which is often so distressing, in cases of impaction; for the urine will generally find its way out alongside of the bougie.

The spasm and retention produced by an impacted fragment in the urethra are liable to be soon followed by rigor and febrile reaction; and these symptoms are often very severe in their character, considering the apparently trifling nature of the obstruction. If the difficulty remain unrelieved, these symptoms persist, and there is danger of local ulceration, urinary infiltration, and abscess. It may become the duty of the surgeon, therefore, if the fragment cannot be withdrawn by the aid of instruments, to cut down upon and remove it at once. When deep in the urethra, this is not an easy operation, and it might be necessary to split the scrotum in order to reach the fragment. In front of the scrotum it is easy enough to cut directly upon the fragment, and to get it out; but, after a wound of this portion of the urethra, a fistulous opening is likely to remain, and this is not easy of cure.

These considerations relating to the possible lodgment of calculous fragments in the urethra, after the operation of lithotrity, are equally applicable to those cases, occurring perhaps even less infrequently, in which renal or vesical calculi are arrested in the urethra during spontaneous effort to escape—no operation of any kind having been attempted.

CHAPTER XVI.

LITHOTRITY.

Lithotrity continued.—Position of the Patient.—Introduction of the Lithotrite.—Method of catching the Stone.—Precautions in crushing.—Manœuvres for catching Stone not easily seized.—Subsequent Crushings after one Successful Effort.—How to find Last Fragments.—Complications in Lithotrity, their Significance and Management.

The position of the patient during the operation of lithotrity is of great importance, for upon it depends the position of the stone in his bladder. A movable stone, in a bladder partially filled with urine, will be found, with very rare exceptions, occupying its most dependent point. The patient must be so placed, therefore, if possible, that the lithotrite when introduced may be carried directly to the stone lying at the bottom of the bladder. The shape of the bladder, which changes materially at different periods of life, must be considered before determining what part of its cavity, in different positions of the body, is the most depending. In the child's bladder, in the erect position, the neck is its lowest point.

When full, the bladder—in early life—is pear-shaped, with its broadest part above, vertical in position, and lifted high out of the pelvis. A movable calculus always drops, therefore, into its funnel-shaped neck; hence the more exaggerated pains which the child suffers. When he lies down upon his back in the horizontal position, the stone will necessarily roll backward toward the fundus of the bladder, which has become, by this change of attitude, its most depending portion. And, now, a lithotrite entering the bladder would tend to glide down a gently-inclined plane, at the bottom of which its beak would almost of necessity come in contact with the stone.

On the other hand, the old man's bladder is no longer pear-shaped; the most capacious portion of its cavity is below, and the increased size at its base tends to tilt its vertex forward. In the erect position there is a distinct excavation below the level of its outlet; a stone would, therefore, tend to gravitate into this cavity, and away from the neck of the bladder, which also has now lost in a great measure its conical shape. In the horizontal position a lithotrite, having freed the orifice of the bladder on entering, would no longer tend to glide down an inclined plane; on the contrary, its angle would project over a cavity, and, if pushed forward, the convexity of its beak would come in contact with the posterior wall of the bladder at a point above the level of its floor—the stone occupying the cavity below the shaft of the instrument, and, unless of considerable size, not having been touched by it. If he should elevate the handle of the lithotrite in order to carry its beak into this cavity in search of the stone, the operator would do violence to the neck of the bladder and prostatic urethra—which is to be especially avoided. The difficulty is met by simply elevating the pelvis sufficiently, by means of a cushion placed beneath the hips, to cause the stone to roll out of the lower cavity of the bladder, and along its floor and back wall—now become its most dependent portion—to the point at which the lithotrite would naturally come in contact with this portion of the bladder.

This change in shape of the bladder takes place gradually as life advances. Where the prostate is the seat of enlargement, or where an horizontal "bar" has formed at the outlet of the bladder, elevating its inferior margin, it is more marked. It is in these cases that the "bas-fond" of the bladder reaches its greatest development. Here, then, the elevation of the pelvis is to be carried to the greatest degree—a hair cushion of six inches' thickness being often required, or even more. The pelvis is to be raised absolutely above the level of the shoulders. If the head be flexed forward and supported by a pillow, this position will not be attended by discomfort. It was this power to determine the position of a stone in the bladder by modifying the patient's attitude that led Heurteloup to insist on the value of his operating-table, which could be lifted and depressed at either end, as on a pivot. Thompson finds a couch of somewhat similar construction of great value in searching for stone.

It is obvious, then, that one of the conditions for successful lithotrity is to place the stone at that point, within the cavity of the bladder, at which it can be found with most certainty by the lithotrite, and with the least necessity of search for it, and of consequent prolonged contact of the instrument with the bladder; and that the surgeon has the power of effecting this by regulating the position of his patient.

Before the patient is placed in position for the introduction of the lithotrite, from four to six fluid-ounces of urine should have been allowed to accumulate in the bladder. This presupposes a capacity of retaining the urine from one and a half to three hours. For a small stone, requiring the smaller lithotrite, the lesser quantity would suffice; but this is the minimum. When the stone is larger, a proportionally greater area is required in the bladder for safe manipulation with the lithotrite. If the patient should be unable to retain his urine long enough to allow the necessary quantity to accumulate, this is the best evidence that his bladder is not yet in a fit condition for the operation of lithotrity. Nothing is to be gained by the injection of tepid water, with catheter and syringe, as formerly practised. The soothing influence of the warm water is more than counterbalanced by the additional manipulations required for its injection, and the consequent lengthening of the operation. It is better, practically, that the patient should be induced to hold his water for the required period, as he had previously been instructed to do for preliminary explorations; and, in fact, that at the time of the operation he should anticipate nothing more than a preliminary exploration. He will thus be saved, in a great measure, from the increased nervous susceptibility that always attends the anticipation of a surgical operation, which, it may be remarked, affects the bladder more than any other organ of the body.

If, as sometimes happens, the urine should be ejected as the lithotrite enters the bladder, in consequence of the sudden invasion of spasm, the lithotrite should be immediately withdrawn in the gentlest manner, and the operation deferred. It is evident that, for some reason, the bladder is not in a favorable condition; and, under these circumstances it is wiser neither to attempt to coax nor force it, by injecting warm water—for this is the only alternative, if the operation is to be accomplished without delay.

INTRODUCTION OF THE LITHOTRITE.—A suitable instrument having been selected, and well oiled, the operator places himself on the patient's right side and inserts its beak into the orifice of the urethra, drawing the penis gently upon the lithotrite with the right hand, as though it were a glove-finger upon a finger, while he balances the instrument lightly in the left, gradually lifting the handle as its beak advances. The handle is thus slowly raised until the shaft of the lithotrite becomes vertical, and, while it is still held in the left hand, the fingers of the right, thrusting the scrotum aside, follow the prominence of its angle as the point of the beak advances into the perinæum. The instrument is to be supported in this position until, by its weight, it sinks deeply enough into the perinæum for the point of the beak to engage in the opening through which the urethra traverses the triangular ligament. If there should be any delay here, the fingers of the right hand may assist by slightly changing the direction of the beak, or, possibly, by lifting it a little, if below the orifice of the triangular ligament. When the point of the beak has fairly engaged in this narrow strait, the handle of the instrument should be transferred to the right hand and allowed to fall gradually, by its own weight, toward the feet of the patient. Just before the shaft of the lithotrite has become horizontal, the point of its beak, in the young subject, will have freed the upper margin of the orifice of the bladder and entered its cavity, and, a moment later, the convexity of its angle, having glided meanwhile along the floor of the prostatic sinus, frees the lower margin of the orifice, and a sense of freedom of motion of the beak of the instrument informs the operator that it has fully entered the cavity of the bladder.

In a patient who has passed middle life, the lithotrite does not always enter the bladder so smoothly. A tendency to increasing excavation of the floor of the prostatic sinus, as well as the similar change of shape, already described, in the floor of the bladder, has the effect of elevating the inferior margin of its outlet. In this manner a sort of transverse barrier is opposed to the easy entrance of the beak of the lithotrite into the bladder; and, when it does enter, there is a good deal of friction of the shaft of the instrument against this barrier during subsequent manipulation. This is a condition of very common occurrence after middle life, and not necessarily caused by, or complicated with, an enlarged prostate. When there is enlargement of the prostate, this transverse bar almost always exists to some extent, sometimes in an exaggerated degree; and, in rarer cases, its central portion assumes the shape of a conical eminence which opposes the farther advance of the lithotrite, unless, indeed, it can be made to pass by being carried on either side of this "middle lobe." In addition to the obstruction liable to be thus offered to the passage of the lithotrite, if the lateral lobes should be irregularly or unsymmetrically enlarged, the prostatic portion of the canal, besides being increased in length, becomes also more or less tortuous in its course, and its walls will be found to be comparatively rigid and unyielding. It is easy to understand how the beak of a lithotrite might be impeded in its progress through such a passage, and also that great gentleness must be exercised to avoid abrasion of its delicate lining membrane. Pressure, applied by the operator's left hand at the root of the penis so as to aid in stretching its suspensory ligament, will very greatly assist the passage of the beak in such cases. Indeed, this manœuvre always aids the passage of the lithotrite while its beak is traversing the prostatic portion of the urethra. Without it the suspensory ligament is stretched entirely by the leverage afforded by the handle and shaft of the instrument, and the point of its beak is presented to the roof of the urethra in an unfavorable direction and with an unpleasant degree of force, altogether incompatible with the easy, gliding movement that is desired.

When the urethra is surrounded by an enlarged prostate and narrowed from side to side by the encroachment of its lateral lobes, it is at the same time correspondingly increased in its vertical diameter; and this peculiar change of shape in the prostatic urethra, together with the delay in reaching the bladder in consequence of the increased length of the passage, is likely to lead to the error, on the part of the operator, of depressing the handle of the lithotrite too soon. For the greater depth of floor and height of ceiling of the prostatic urethra under these circumstances will readily permit the beak of the instrument to rise into its cavity, and the operator, regarding only the depth to which his lithotrite has penetrated, may readily deceive himself with the idea that its beak has entered the bladder, when, in reality, it is still in the prostatic sinus. The difficulty experienced in inclining the beak of the lithotrite from side to side, by rotating its handle, will at once correct this wrong impression. By again elevating the handle of the instrument, so as to depress its beak, and very gently urging it forward, with patience and care it will probably soon glide into the larger cavity of the bladder. The great depth to which the lithotrite penetrates, in cases of enlarged prostate, before its beak is fairly lodged in the bladder, will pretty surely surprise the young operator. In this connection it is well to consider the very great lever-power developed by depressing the handle of the lithotrite when its beak is deeply lodged in the urethra. If this movement should be attempted prematurely—for example, before the beak had engaged in the narrow passage through the triangular ligament—there would be danger of forcing it with dangerous violence against the roof of the urethra, perhaps of producing laceration. But, after the beak has entered the prostatic sinus, the leverage is still greater, for the lower margin of the opening through the triangular ligament would now serve as a fulcrum to the lever, while the length of the shaft of the lithotrite and the weight of its handle give dangerous power to its longer arm. It behooves the operator, therefore, to manage it with a light hand, and much caution.

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Although obstacles may be encountered in introducing the lithotrite where there is an enlarged prostate, it is proper to remark that, in many of these cases, the enlargement of the prostate affects mainly its outer circumference; it is "peripheral" rather than "central," and the urethra may be as free and capacious as could be desired.

When the sense of freedom of motion conveyed to the hand of the operator announces to him that the beak of the lithotrite has fairly entered the bladder, he still maintains the shaft at the same angle with the patient's body it had when entering, and allows the beak of the instrument to glide slowly onward, as far as it will, listening intently, so to speak, with his fingers, for its contact with the stone. When the calculus is movable, and the position of the patient has been judiciously adjusted, with the proper quantity of urine in his bladder, it will generally happen that, before the convexity of the beak of the lithotrite is arrested in its progress by the posterior wall of the bladder, the stone will have been touched by it; and the operator should be able to say, at once, on which side of the instrument the stone is lying. He now very cautiously turns its beak a little away from the stone, and, by gently withdrawing the male blade, opens the jaws of the instrument widely enough to grasp it. The beak of the lithotrite is rotated away from the stone before moving the male blade, in order to prevent the concavity of its jaw, as it is being withdrawn, from striking the stone and thus altering its position; and the previously-ascertained size of the stone determines, by reference to the graduated scale on the handle of the instrument, how widely its jaws are to be opened. It is to be observed that the female portion of the lithotrite is held lightly but steadily in its place by the left hand of the operator, while the instrument is being opened, the convexity of its jaw pressing gently against the posterior wall, where this latter meets the floor, of the bladder; the male blade only is moved, and by his right hand. The jaws of the lithotrite being now open, are to be turned toward the stone, by rotating the handle of the instrument, so as to incline them to the horizontal position, or until further rotation is resisted, and gently closed upon it. As soon as the stone is felt to be fairly and firmly grasped between the jaws of the lithotrite, the instrument is rotated back again until its jaws are vertical, as before they were opened, and the button-trigger, at its handle, is pressed back by the thumb of the right hand, thus fixing the male blade, and at the same time bringing the screw into gear; then, by slowly turning the wheel, the screw-power is applied to the stone. Before turning the screw, the operator should satisfy himself, by the slight withdrawal and partial rotation of the lithotrite, with the calculus in its grasp, of the perfect mobility of the instrument in the bladder, and that no portion of the lining membrane of the latter has been included between its jaws. This caution, formerly very much insisted upon, has lost much of its force since the construction of the lithotrite has been made so perfect that the nipping of the bladder is almost impossible. Still, it should not be forgotten. Usually the practised hand will receive satisfactory evidence of the absence of entanglement with the walls of the bladder, while turning back the jaws of the lithotrite to their original position, after picking up the stone, and in withdrawing it a trifle so as to insure the safety of the posterior wall of the bladder from contact, while the screw is being turned.

As the jaws of the lithotrite are slowly closing upon the stone, the operator will recognize, possibly both by hand and ear, a sharp cracking, or a softer crushing sensation, according to the nature and degree of hardness of the calculus. Having screwed the male blade well home, he then slips the trigger forward by a motion of his right thumb, and opens again the jaws of the instrument. And now, as experience has demonstrated that when a calculus is large enough to make several fragments, under the crushing of the lithotrite, they all fall together at the bottom of the bladder, it is only necessary for the operator to turn the open jaws of the instrument toward the same spot at which the stone was first seized, and, on closing them, he will almost inevitably seize a fragment. This manœuvre may be repeated again and again, from once to three or four times, or even more, according to the skill of the operator, and the tolerance of the bladder; but the whole proceeding should not occupy a longer time than from three to five minutes, the former for first crushings and sensitive subjects, the latter where the tolerance of the bladder has been proved. This is a rule that the lithotritist should always respect. It would involve possible risk of injury if an instrument were simply allowed to remain in an ordinarily healthy bladder for the space of five minutes; how much more when all the manœuvres of lithotrity are superadded in a bladder already irritated and diseased!

Precautions in Crushing.—To accomplish as satisfactory a result as possible, with the least risk of injury to the bladder, in crushing a calculus, there are other rules to be observed. In opening the jaws of the lithotrite by withdrawing the male blade, the operator should be cautious in limiting this movement to the assumed size of the stone or fragment, and never, if possible, bring the concavity of its jaw in contact with the neck of the bladder, as this contact always occasions pain, and might cause spasm. Always open the jaws of the lithotrite in the vertical position before rotating them in quest of a stone or fragment. It is a common error to use the lithotrite as a sound, or searcher; and, when a stone or fragment has been struck, to open the jaws of the instrument in close contact with the stone, through fear of losing it. This is bad practice. In withdrawing the male blade, to open the lithotrite, the stone or fragment thus sought is very likely to be moved out of reach by contact of its jaw. Where the stone has not been brought within the grasp of the jaws of the instrument by skillful management of the patient's position, there are well-tried rules for finding it, with which every good operator must be familiar; these will be shortly given in full.

Again, all the movements of the lithotrite thus far described, viz., the opening and shutting of its jaws, the rotation of its shaft, and the application of the screw-power, are to be managed without altering the direction of the shaft of the instrument in its relation to the axis of the patient's body. Any deviation from the direction assumed by the lithotrite after entering the bladder, is unnecessary for the successful performance of the manœuvres which have been described, and it will certainly involve friction or undue pressure upon, and possible injury to, those sensitive parts—the prostatic urethra and neck of the bladder—by which the shaft of the instrument is most closely embraced. It is to be remembered that the urethra is occupied by a perfectly straight, unyielding instrument, which causes tension of the suspensory ligament of the penis, and impinges forcibly upon the lower lip of the outlet of the bladder; and that every change of direction at the ends of the instrument, which are free, bears almost entirely upon that portion of the canal included between the opening in the triangular ligament and the neck of the bladder. The operator, therefore, cannot be too careful to observe extreme gentleness and smoothness in all his manipulations, and to avoid every thing like jar or sudden motion.

MANŒUVRES FOR CATCHING FRAGMENTS. — Sir Benjamin Brodie's favorite manœuvre of gently striking the handle of the lithotrite in order to make the stone roll between its open jaws, although a successful expedient, has been justly criticised because it rarely fails to elicit an expression of pain from the patient. The practice of jarring the pelvis by a slight blow, applied to the crest of the ilium for the same purpose, is open to a similar objection. The increasing safety and certainty of modern lithotrity seem to be due largely to the fact that greater caution is exercised in guarding against mechanical lesion by using more perfectly-made instruments, and handling them with extreme gentleness. The principle has been established that it is safer for the surgeon to seek the stone, in a locality already ascertained, by a series of systematic, well-practised manœuvres with his instrument, than to sink the convexity of his lithotrite into the floor of the bladder, open its jaws, and then jar the instrument, or the patient's pelvis, in order to get the stone between them. In short, it involves less danger to the bladder, for the surgeon to go after the stone with his lithotrite, than to compel the stone to come to the lithotrite, held in a fixed position. The latter has been the English practice; the former, the method finally adopted by Civiale, and for this Sir Henry Thompson, the highest authority among living lithotritists, after fairly trying them both, expresses a decided preference. But, in truth, lithotrity as practised at the present day includes the advantages of both of these methods, their faults having been, in a great measure, eliminated by the teachings of experience. By careful adjustment of the patient's position, the exact point occupied by the stone is determined with so much accuracy, and it is brought so near to the jaws of the lithotrite, that very limited movements of the instrument are required in order to grasp it. The precise character of these movements is now to be described, and they are to be carefully studied by the operator who desires success, for he should have the details of all necessary manipulation clearly in his mind, and through practice upon the dead body should have acquired the ability to apply them with precision as required.

It has been already stated that in a patient judiciously prepared for the operation and properly placed in position, the lithotrite will strike the stone in a majority of cases, when introduced according to the rules which have been given. When the expected contact of the stone does not take place and the beak of the lithotrite has reached the most depending point of the bladder without detecting any evidence of its position, then the operator proceeds as follows: He opens the jaws of the instrument, by withdrawing the male blade to the required extent, and inclines them first to one side, to an angle of about 45°, and then closes them; failing to catch the stone, he inclines them to the same degree on the other side, and closes again. By one or the other of these movements the stone is almost certain to be caught. If not, the manœuvre is to be repeated, inclining the open jaws of the lithotrite to a greater angle, even to the horizontal position, if no resistance is encountered, and carefully closing them, first on one side of the bladder, then on the other. If it should happen, as is rarely the case, that the stone is not caught, or even touched, by any of these movements, and if the larger lithotrite, generally required for a first crushing, has been employed, then it is wiser that the surgeon should very quietly withdraw the instrument, consider the whole proceeding as an exploration, and take time for further study of the requirements of the case—some of these not having been properly met. It is better that he should stay his hand and accept momentary disappointment, than incur the slightest unnecessary risk—especially to be dreaded after a first crushing—of unpleasant consequences from prolonged contact of the instrument with the bladder. Here the advantage is apparent of not having previously announced that the crushing operation was to be performed at a time fixed for the purpose, as already suggested; for the patient will have been spared not only its anticipation, but also the demoralization which might follow a suspected failure. And there are other contingencies, such as the occurrence of an unusual amount of pain or of sudden spasm of the bladder on introduction of the lithotrite, or difficulty in seizing a full-sized stone with the lithotrite of largest curve, where postponement of the operation until another day would be judicious, the possibility of which confirms the wisdom of this policy. The experienced surgeon knows that it is useless to contend with the bladder in certain moods, and his tact leads him to defer action without hesitation, when necessary, and await a more favorable opportunity.

When it has been ascertained during the preliminary study of a case that there is an excavation at the base of the bladder, behind the inferior margin of its outlet, where a stone, if present, would almost invariably be found, and especially when there is enlargement of the prostate, an additional manœuvre may be required. In this, the beak of the lithotrite, by rotation of the handle of the instrument, is swept round a half-circle, until it looks backward toward the patient's rectum—assuming what is called the "reversed" position. To accomplish this manœuvre, it is necessary to depress the handle of the lithotrite between the thighs of the patient, changing the oblique direction of its shaft until it is in a line with the axis of the patient's body, or even below it (Fig. 98). This movement lifts the beak of the instrument toward the centre of the bladder, so that, while being revolved in its cavity, there is less danger of rough contact with its walls. Very possibly this rotation of the instrument may result in contact with the stone, and afford enough indication of the position of the latter to enable the operator to grasp it at once. If not, he should proceed to incline the open jaws of the lithotrite, first to one side to an angle of 45°, and close them, and then to the opposite side and close. For this manœuvre the lithotrite with smoother jaws is preferably used. The instrument with largest curve and longest jaws is rotated into the reversed position with some difficulty and pain to the patient; moreover, a stone so large as to require its employment could be almost certainly recognized and seized without reversing the instrument, certainly without reversing it completely. For very small stones—where there is an excavation at the base of the bladder, or to find a last fragment—still another manœuvre will be found useful, and for this the lithotrite with broad, smooth blade (Fig. 82) is to be preferred. The instrument being lodged in the bladder, is rotated into the reversed position, and gently withdrawn, until the concavity of its beak is almost in contact with the lower margin of the outlet of the bladder. The male blade being now held firmly in position, the female blade is projected until it touches the posterior wall of the bladder, and, the handle of the instrument being raised enough to allow the broad extremity of the female blade to impinge lightly upon the floor of the bladder, the latter is gently drawn home—raking in, as it were, any fragment that might lie in its way.

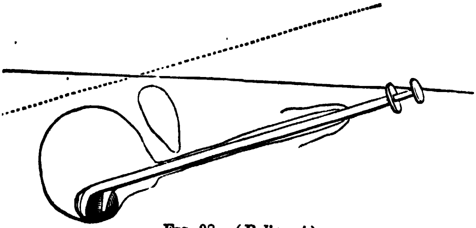

FIG. 98.—(*Reliquet.*)

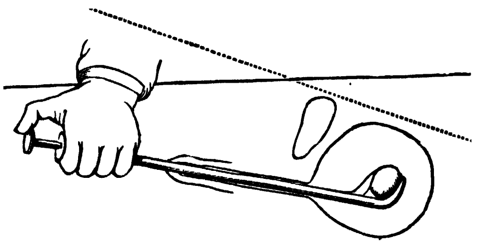

FIG. 99.—(*Reliquet.*)

In both of these latter manœuvres, in which the reversed position is employed for seizing the stone, the jaws of the lithotrite, with the stone or fragment in their grasp, are to be rotated back again into the upright vertical position in the centre of the bladder (Fig. 99) before the screw-power is applied.

By the aid of the three manœuvres which have been described, or of a combination of them, with possibly some modification required by exceptional cases, a surgeon of ordinary dexterity will be able to manage successfully any movable vesical calculus, if not excessive in size or hardness, without serious injury to the bladder. But careful study of the details of manipulation and practice upon the dead body should not be neglected. It is always to be borne in mind that these movements are to be conducted invariably with deliberation, and that gentleness and smoothness of motion are especially desirable. Every thing like a jerk or sudden movement should be studiously avoided. In opening, closing, and rotating the lithotrite, as little change in the direction of its axis as possible should be permitted; this change in direction is very liable to occur while the male blade is being screwed home, and at this moment vibration and lateral motion should be guarded against with the greatest care.

In withdrawing the lithotrite after crushing, care is required lest there may remain so much *débris* between its jaws as to cause abrasion of the neck of the bladder or of the urethra. The scale at the handle of the instrument, with which the eye of the operator should be familiar, will tell him if the jaws are well closed. If there be any doubt on this point, or if there is complaint of pain as they engage in the neck of the bladder, let him return the beak of the instrument to the centre of the cavity, and unload the jaws more completely by slight, successive movements of opening and closing.

Subsequent Crushings.—It happens in a certain proportion of cases, where the stone is small and the urethra healthy and capacious, that the patient finds himself completely relieved of his symptoms after a single operation. Where this is not the case, an interval of from three days to a week should be allowed to elapse before a second operation is undertaken. The length of the interval will depend upon the amount of reaction following the operation, and in some degree also upon the amount of *débris* discharged. After a first crushing this is usually not great, especially if the stone is hard—the fragments being mostly too large to pass. It is not customary to await the discharge of *débris*, unless, indeed, the amount be very considerable, in which case it is well to get rid of all that will pass within a reasonable time. The main point to be considered, in deciding how long to wait before a second crushing, is, whether the reaction caused by the first operation has subsided, or nearly so. This is to be determined by the amount of complaint elicited by pressure over the pubes, by the degree of irritability of the bladder as shown by the length of the interval between the calls to urinate, and the condition of the urine as to the presence of pus, as compared with the state of the patient before the operation.

As soon as it is evident that no progressive trouble has been caused in the bladder, and that existing irritation is subsiding, the second operation should be undertaken. As a rule, it may be assumed that the bladder will show less sensibility after a first operation has been well borne. But exceptions are not infrequent. The presence of two or three sharp, angular fragments of a large, hard stone would tend to keep up irritation.

The object of the surgeon is now to reduce fragments to powder: he can, probably, make use with advantage of a lithotrite with shorter, smoother jaws, and allow himself a little more time for the operation. In other respects the manœuvres required are the same as those already described.

The escape of detritus after a second operation is usually greater; but this is not to be looked for too anxiously. If the object of pulverizing the fragments be thoroughly accomplished, the result may be safely left to take care of itself, unless the expulsive power of the bladder be defective. Too great anxiety to get rid of the results of a crushing is likely to result in impaction of fragments in the urethra.

The surgeon's increasing familiarity with the degree of tolerance of the patient's bladder will enable him to regulate the proper intervals of subsequent crushings as required. Usually, when conducted with proper precaution as to care and gentleness, these are borne better and better. The intervals between the calls to pass water become gradually longer, and other evidences of irritation of the bladder diminish in like degree. At length, sand and fragments cease to pass, and the surgeon has difficulty in finding a fragment in the bladder to crush, or fails entirely. As already stated, this result may follow a solitary crushing, or it may require a score of successive operations, or even more; usually, the number is from three or four to ten, before the evidence becomes apparent that the stone has been removed.

Is the patient cured? It is not always easy to answer this question, and it is very important that it should be answered with certainty, for the retention of a small fragment might become the origin of a new calculous formation.

The charge has been brought against the crushing operation that patients are more liable to relapse after it than after cure by the knife. The charge is probably unfounded in truth, but it obviously owes its aspect of probability to the results which have followed want of care in getting rid of last fragments. Thus, the detection of the last fragments, which is, in fact, the proving of the cure, becomes a point of much importance in the operation of lithotrity. Careful search should be made, therefore, with the lithotrite with short, broad jaws, by employing all the manœuvres which have been described, if necessary, to verify the absence of any remaining fragment. Where all symptoms of vesical irritation have disappeared, and the microscope discovers no traces of blood or pus in the urine, the patient may be pronounced to be free from stone. But where the urine remains turbid, as is generally the case—for the evidences of cystitis always disappear slowly, and, in old cases, never entirely—and this symptom is increased, or blood is detected after motion, as in riding, and there is not absolute relief from tenesmus at the close of the act of urinating, then a decision should be deferred, and the search repeated. A small fragment is more readily caught when the bladder contains a diminished quantity of urine. The position of the patient should be varied by more or less elevation of the pelvis, according to the nature of the case, remembering that while a small fragment is usually found well back from the neck of the bladder, nevertheless, from its lightness, it is almost certain to be carried forward toward the outlet as the urine escapes. This latter circumstance is taken advantage of by employing a lithotrite with a perforated shaft, through which the urine may be permitted to escape, or injected, as desired, so that the amount of water in the bladder may be varied during the search. By placing the patient in a standing position, leaning slightly forward, with the jaws of this instrument held open at the neck of the bladder, and then allowing the urine to flow out, Sir Henry Thompson succeeded, in a very difficult case, in catching the fragment. Of course, in this manœuvre, the jaw of the male blade is held in contact with the outlet of the bladder, and only the female blade moved, both in opening and closing the instrument. Civiale's "trilabe" (Fig. 78) is also recommended by this skillful operator. It is to be held open at the neck of the bladder, in a similar manner, so that its three branches form a sort of pyramidal cage, with its apex downward, and in this, as the urine escapes through the hollow shaft of the instrument, the fragment is caught.[1] When there are sacculi in the walls of the bladder, or even slight depressions which have formed between interlacing hypertrophied muscular fibres, a small fragment might become so fixed in one of these as to escape detection. In such a case, full, free, and repeated injections of tepid water into the bladder would be likely to detach the fragment and bring it away, or, at least, within the reach of the lithotrite. It is favorable for the surgeon that, in searching for last fragments, he has usually to deal with a bladder in an improving condition, the tolerance of which he has already proved and established. Under these circumstances there is room for more freedom in manipulation, and, in the great majority of cases, there will be little difficulty in final success.

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[1] I succeeded in a case, after frequent disappointment, by the following rather rough and somewhat unjustifiable manœuvre. After opening the lithotrite in the usual position in the bladder of the patient, who was a little old man, I passed my right arm beneath his bended knees, and, holding the lithotrite and penis steady with the left hand, lifted his pelvis from the bed and brought it down again with a slight jolt. All that can be said in favor of this manœuvre is, that it was twice successful, and that it was followed by no harm.—VAN BUREN.

Complications.—It is well to consider what modifications of the operation may be rendered necessary by the presence of complications; for, although, when the stone has been discovered early, nothing is usually more simple and sure than its cure by lithotrity, there will be inevitably a certain proportion of old, neglected, and aggravated cases encountered in practice, which, by the aid of trained intelligence and skill, may also be brought within the scope of the operation. For these the alternative is lithotomy, with its increased risks to life. Even when the calculus has been discovered, while yet of small size, the sensibility of the urethra and neck of the bladder is, in some cases, so excessive and persistent as to constitute a positive obstacle to lithotrity. As a rule, where there is no serious alteration of texture, this extreme sensitiveness is gradually blunted by the gentle and judicious use of instruments during the preparatory treatment. But in some cases, happily rare, this result does not follow; and each exploration, however carefully conducted, is succeeded by increased frequency and urgency of the calls to urinate, with pain in the bladder, radiating, from its neck as a centre, to the hips, sacrum, perinæum, and hypogastrium. Exaggerated nervous susceptibility, of this kind, is not necessarily accompanied by pain on deep pressure above the pubes, or by increase in the quantity of blood or pus in the urine, and it subsides in a day or two, often sooner, to be renewed with undiminished force after each successive exploration. It is readily distinguishable from the consequences of mechanical injury to the urethra or bladder, from too rough use of instruments, by the absence of persistent febrile reactions, and of the positive symptoms of inflammation.

Occasionally the intense nervous irritability of the subject will manifest itself in the shape of a chill, sometimes followed by fever and sweat, sometimes not. This phenomenon occurs more frequently, possibly, in persons who at any time have been exposed to malarial poisoning, but not necessarily. A chill may thus follow each attempt at exploration of the bladder. Here the free use of quinine is sometimes beneficial.

This persistent hyperæsthesia is more often encountered in the young, but also in a fair proportion of old, broken-down subjects of urinary disease, and it is often due to perverted sensibility of the nerves which supply the sexual surfaces—mainly the prostatic urethra—and to the peculiar degradation of general nerve-power often associated with this morbid condition. It is analogous to certain forms of irritable stricture, and also to the nervous affection of the deeper portions of the urethra and neck of the bladder, already described as neuralgia of the vesical neck. It is often associated with more or less pusillanimity of character, and its victims not unfrequently become addicted to the habitual use of alcoholic stimulants or opium.

In a case of this kind which has resisted gentle approaches and failed to yield to quinine, when the surgeon has satisfied himself that the usual causes of exaggerated pain are absent, and that the urinary surfaces are in other respects in fair condition, his proper course is to have the patient placed thoroughly under the influence of sulphuric ether, and proceed at once to crush his stone.

Of course, when the urethra and bladder are thus rendered insensible to rough contact of the instrument, it will be incumbent upon the operator to employ even more deliberation, and more scrupulous care in his manipulations than usual, for he is deprived of the evidence of the patient's sensations, which ordinarily serve as a warning against neglect of gentleness, or precipitation in movement. With these precautions there need be no hesitation in the employment of anæsthetics. At present sulphuric ether is preferable, as by its skillful administration the patient can be more certainly rendered perfectly motionless without danger to life.

It has been hitherto considered wiser to abstain from the employment of anæsthetics in lithotrity save in exceptional cases, but, with the systematized manœuvres and the perfected instruments now in use, there is no reason why the trained and careful surgeon should deprive his patient, or himself, of the great advantages which it not infrequently offers in cases which are neither grave nor exceptional. It is true that in the great majority of the cases which present themselves for lithotrity, the trivial character of the pain of the operation renders anæsthesia entirely unnecessary, and it should never be employed to do away with the usual sensibility of the parts, in an ordinary case of stone; it is far better that these should be rendered tolerable by the regular systematic training to the contact of instruments during the preparatory treatment. This preparatory training is as necessary for the surgeon—to familiarize him with the condition of the patient's organs—as it is for the patient, to accustom him to the contact of instruments. For lithotrity in children, anæsthesia is a necessity; and, in women, the recognized propriety of its employment would tend to increase the usefulness of the operation. Experience has proved that the dangers anticipated from its use have not been realized, and we are justified in the conclusion that in careful and judicious hands they are no more to be feared than in other operations of surgery, where increased risk is more than overbalanced by increased advantages.

Atony of the bladder is a complication for which especial measures are required. It was formerly regarded as a serious, if not an insuperable, objection to the crushing operation; at the present time, in view of the success attending its management, atony is rather considered an advantage than otherwise, through the freedom from exaggerated and spasmodic contractions of the bladder which its presence insures to the operator. The loss of contractility may be partial—affecting only portions of the bladder, and not the whole organ. It may be complicated with exaggerated contractility, even of other portions of the bladder-walls—recalling the condition of the uterus known as "hour-glass contraction." By this latter combination of symptoms the phenomenon is explained, of calculi being retained in unusual positions in the bladder, contrary to gravity; as, for example, above and behind the pubes, giving rise to suspicion of sacculation or encysted calculus, when no such condition exists, and interfering sometimes with the success of the manœuvres of lithotrity. Atony is also variable in degree, in the same patient, at different times. One day he may be able to empty his bladder completely; a few days later the surgeon may find a residual accumulation amounting to four or five ounces. As a rule, the contact of instruments employed in explorations, and especially manœuvres with the lithotrite, stimulates a weak bladder to stronger contractions. But this recovery of power is not permanent; the atony returns, and often in a greater degree. It has been observed that atony has followed the successful cure of stone by lithotrity, assuming the relations of effect to cause. Such a result is neither unphysiological nor improbable. The phenomenon of contractility in muscular fibre is a peculiar manifestation of vital force, and one of its peculiarities is that undue excitement is followed by corresponding loss of power. If the excitement be excessive and prolonged, the consequent exhaustion may be permanent. The vesical atony may have been recognized only during the search for stone, in which case the latter should be left unmolested until the former has been treated, and the tolerance of the bladder established. The tendency of the bladder to fall into acute inflammation upon drawing off its contents would be greatly increased by the mechanical irritation of lithotrity, and there might be induced a grave form of general cystitis, tending to a fatal result through invasion of the kidneys.

By avoiding the dangers peculiar to atony, the treatment of calculous patients with this complication is usually followed by satisfactory results. It must be borne in mind, however, that it is a condition which exists more commonly than is generally supposed, and often escapes detection until bad results force it upon the surgeon's notice. When present it is a necessity for the patient to be taught to use a catheter for himself, whether he is to be lithotrized or not; and, where lithotrity is contemplated, this is an indispensable condition.

When this complication exists, it is always a matter of probability that the calculous formation in the bladder has been preceded—in fact, that it has been caused—by the atony, both perhaps preceded and caused by enlarged prostate. In addition to the catarrh and possible atony which are likely to accompany it, an enlarged prostate may constitute an obstacle to lithotrity in two ways: by preventing the ready introduction of instruments into the bladder, and by hindering the escape of fragments, both of which difficulties have been already considered. When associated with an enlarged prostate, atony is not only not unfavorable to lithotrity, but in many cases a positive advantage; the manœuvres of the operation are quietly borne, for they are painless, there is no danger of fragments being crowded into the urethra by spasmodic contractions of the bladder, after the operation, and, as to evacuation of *débris*, this can usually be accomplished by judicious management, without delay or danger. The conduct of the case simply involves the necessity for more time and care.

ENLARGED PROSTATE, WITH IRRITABILITY.—Of all the complications of stone which interest the lithotritist, perhaps the most troublesome cases are those in which an enlarged prostate is associated with exaggerated sensibility of the neck of the bladder, with a tendency to spasm; and these are not uncommon. Patience and great delicacy of manipulation are necessary in their management; the patient should be trained to lie on his back as much as possible, with the pelvis raised; uva ursi, buchu, and alkaline diluents, are to be administered in accordance with the grade of the cystitis; and anodyne suppositories in the rectum, if well borne, are often of the greatest service. The patient is an old man; his daily habits and peculiarities are to be studied; and, with due respect to hygiene and dietetics, they should be interfered with as little as possible. The question will probably arise as to the propriety of employing an anæsthetic. If the stone be small, so that its *débris* may be got rid of promptly, and there is no serious organic disease, this question may be answered in the affirmative; and, after a fair trial of alleviating means without result, the surgeon should act at once. The proper course would be to select a favorable opportunity, anæsthetize the patient, and, having pulverized the stone as thoroughly as possible, consistent with safety, proceed at once, by the aid of an evacuating catheter and the injecting apparatus (Fig. 88), to bring away the *débris*. This proceeding is, of course, attended by risk, but, with the requisite skill and judgment on the part of the surgeon, the success is often very gratifying. When the stone is larger, requiring more than one operation for its removal, and especially if there is a possibility of the presence of obscure renal disease, which cannot always be determined in advance, then the risks become greater. Acute cystitis is liable to supervene, or uræmic poisoning may explode in any of its manifold forms, and place life in imminent danger. The case of the late French emperor illustrates this point.

Where stricture of the urethra exists at several points in the canal, and the disease is of long standing, lithotrity is of doubtful utility. With a large stone and the prospect of numerous repetitions of the operation, the chances of the impaction of an escaping fragment in the defective urethra become very prominent, and, in most cases, this is a serious accident, even where the canal is healthy. When there is much cystitis and irritability of the bladder or urethra, the case is still more unpromising. It must be remembered that no treatment can certainly restore the walls of a strictured urethra to their original flexibility, and that local pus-secreting surfaces in the canal of any duration are rarely if ever again covered entirely by healthy epithelium. A very slight amount of mechanical irritation from instruments or calculous *dêbris* after so-called "cure" of stricture would almost certainly renew local inflammatory excitement, with tendency to spasmodic contraction at the damaged points of the canal. A preliminary treatment of the strictured urethra of indefinite duration, by dilatation and incision, would be unavoidable, and the subsequent use of a full-sized instrument by the patient himself and his intelligence and docility are of necessity assumed. For a patient in whom these qualities were wanting, if under the age of fifty, lithotomy would offer at least equal chances of a safe cure. For a younger subject, with a smaller stone, the risk of possible impaction being fairly assumed, the tendency of modern practice is growing gradually more favorable to lithotrity. In such a case, after most careful preparation, the stone should be thoroughly reduced to powder, and the escape of detritus should be rather delayed than courted.

A case is not suitable for lithotrity in which the cystitis is intense in character, and of long standing, and accompanied necessarily by hypertrophy of the walls of the bladder, with contraction. The cystitis may possibly have existed before the formation of the stone, may be due to stricture, or other causes than stone; epithelial degeneration may have developed itself in its mucous membrane, or cancer, in some other form, in the walls of the bladder. A judicious trial of means calculated to reduce the grade of the inflammation would be proper in a case presenting this aspect, and, meanwhile, accurate diagnosis is to be sought for; but, as soon as the inefficiency of these means becomes evident, or the presence of cancer is assured, the idea of lithotrity should be abandoned.

Repeated and continued hæmorrhage after each exploration, in a case of stone, is suggestive of the possible existence of villous growth, or at least of a very unusual amount of congestion of the mucous membrane of the bladder, and, in either case, the prompt removal of all cause of irritation from the bladder, by the knife, will afford the best chance of cure, if, indeed, the case do not prove too desperate for any operation.

The presence of a *large hydrocele* of the tunica vaginalis, which can usually be got rid of; or of an *irreducible hernia*, which is likely to prove more troublesome; or of an *anchylosis of the hip-joint*, with inversion and adduction of the thigh from hip-joint disease, may so far interfere with the introduction of the lithotrite, or indeed of all rigid instruments, as to compel a resort to lithotomy.

In *hypospadias*, when the deformity is excessive, the urethral orifice may be too small to admit a lithotrite, and too thin and ill-formed to justify enlargement by the knife; but, generally, by employing additional care in manipulation, this complication does not prove insuperable, although it is always a source of annoyance.

It may be laid down as a rule sanctioned by experience, that in cases of stone presenting complications which render lithotrity of doubtful propriety, where the earlier efforts at exploration are followed by an aggravation of the patient's symptoms which does not subside promptly, and the necessity of lithotomy becomes imminent, it is better to decide upon the cutting operation at once, unless the case prove to be one of those in which no operation whatever is advisable. The temper of calculous patients is often of a character to bear disappointment badly, and the depression likely to follow the occurrence of unexpected pain or difficulty, if prolonged by repeated trials, might compromise the success of the cutting operation when too long delayed and undertaken as a last resource.

CHAPTER XVII.

LITHOTRITY.

Lithotrity continued.—After-Treatment.—Precautions and Care after Crushing Operations, with Consideration of Complications liable to arise, and the Methods of meeting them.—Lithotrity in Children.—Lithotrity in Women.

THE *after-treatment* in lithotrity comprises the management of the patient after each attempt to crush a stone or fragment, and also the measures required, after the last fragment has passed, to confirm the cure and prevent relapse. All the intercurrent symptoms, conditions, and accidents, liable to follow the manipulations of lithotrity, are also to be considered. On the first two or three occasions that the patient passes his water after the operation, he will suffer necessarily some increase of pain, but with the usual precautions this will require no further interference. If the calls to empty the bladder become more frequent, however, with persistence of the increased pain, and especially if there should be any tendency to spasm of the bladder, it is advisable to employ an opiate suppository, or enema, at once. Spasmodic contractions are especially dangerous while freshly-made fragments are in the bladder.

Next to a just estimate of the necessity for short operations and gentleness in manipulation, perhaps the most important point in the modern practice of lithotrity is the rule which requires the patient to keep the horizontal position for at least twenty-four hours after the crushing of the stone has been effected. Its object is to prevent sharp, angular fragments from coming into contact with the sensitive neck of the bladder until their edges have become rounded off by attrition, and thus to avoid the more frequent recurrence of the desire to empty the bladder which would be provoked by their presence, and to escape the violent spasmodic contractions which would be likely to force into the urethra fragments too large as yet to pass readily. By this precaution the impaction of fragments in the urethra, an accident formerly so much and so justly feared, has become rare, and may be rendered almost impossible. Where the sensibility and contractility of the bladder are exaggerated, as is generally the case, it is advisable not only to keep the patient on his back, but also to maintain the pelvis in an elevated position by a cushion placed beneath it; if the symptoms are excessive, an anodyne suppository will render this restraint more tolerable to the patient, and his confinement to the horizontal position should be prolonged to forty-eight hours or more, or until any aggravation of symptoms caused by the operation has begun to subside.

A urinal of proper construction having been provided, the patient should be instructed, when the desire to void urine comes on, to roll over on to his side and use it, without raising his shoulders. This manœuvre may be awkward at first, like having a stool for the first time in the horizontal position, but it is imperative. A difficult patient should have been trained to it during the preliminary treatment.

Usually after crushing, in an ordinarily favorable case, the cushion is removed from beneath the patient's hips, and he is directed to keep his bed for twenty-four hours, and then allowed, with proper precautions, to resume his usual habits. If he has suffered much pain from the operation, or any reaction is feared, it is proper to order warmth to the feet and a hot fomentation or mustard-poultice to the lower part of the belly, or a caoutchouc bag of hot water to the perinæum (Fig. 74). If there is reason to suspect that the patient is threatened with a chill, ten or fifteen grains of quinine may be given at once, with a quarter of a grain of morphine or its equivalent, in hot ginger or any aromatic tea. This is preferable to the wine or "toddy" recommended by English authors; alcoholic stimulants are rarely admissible in inflammatory conditions of the urinary surfaces, save in extreme exhaustion, or where death is threatened through failure of the heart's action; their use invariably imparts a more irritating quality to the urine. In patients beyond middle life, where the urine as it reaches the bladder habitually contains acid in excess, a mild alkaline diluent should be used regularly.[1] Food should be judiciously selected, and taken in moderate quantities at regular intervals. Exposure to cold, especially of the lower limbs, and at the water-closet, is to be avoided.

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[1] The urea, from waste of tissue in advanced life, is present in the form of uric acid in the urine, in addition to the normal acidifying influence of phosphoric acid in the shape of acid phosphates. The citrate of potassa to the amount of one to two drachms a day, in a sweetened vehicle flavored with essence of lemon, taken with flaxseed-tea in liberal quantity, rarely disagrees with the stomach, and is usually acceptable to the taste. It is equivalent to fruit-juice in correcting excess of acidity in urine. The citric acid disappears in the process of digestion, and the alkali is eliminated by the kidneys in the form of carbonate, as is proved by the effervescence of the urine on addition of acid

These directions apply to an ordinary, favorable case, where the patient is not obliged to keep his bed, except as a matter of precaution. When complications are present exceptional measures may be required. If, for example, there are atony and a very irritable bladder, with a dilated "bas-fond," and the patient has been subjected to the necessary preparatory treatment, the evacuating catheter may be employed at once, and the injection made in the upright position, immediately after the operation. By a recent French author the immediate evacuation of *débris* by injection is laid down as the regular rule after each crushing.[1] This practice is not in accordance with the policy sanctioned by accumulating experience, and adopted by the masters of the art, which inculcates *short sittings* and the *avoidance of all unnecessary contact of instruments with the bladder.* Immediate evacuation is only proper as an exceptional proceeding. The reasoning of Sir Henry Thompson[2] on this point is unanswerable: "On no account," says he, "should the bladder be injected or washed out after the first sitting," etc. In an ordinary case, if the patient should not be able to pass water after the operation, as sometimes happens, and the pain, from this cause, becomes urgent, a soft, large-eyed catheter should be introduced, and, unless spasm be present, it would probably tend to allay excitement and irritability to make one or two injections with warm water. But this is not done to aid the escape of fragments; and officiousness is always to be avoided. The cause of the retention is either an impacted fragment, or disturbed innervation of the bladder; most probably the latter. The course to be pursued, in case the catheter should encounter a fragment in the urethra, has already been considered. Where nervous disturbance predominates, with pain as the prominent symptom, the comforting influence of opium is all-powerful; where this does not agree, hyoscyamus is of value; so, also, are conium and belladonna. Codeine sometimes answers, when opium acts unpleasantly; and the bromide of sodium, with the addition of a small quantity of chloral, has a quieting influence. The simple presence of the surgeon, conveying assurance of the absence of danger, is often the best remedy. It must be remembered that the emotion of fear has a remarkable influence in stimulating vesical irritability, and that this cause of eccentric action of the bladder is very often present, even when stoutly disclaimed. There are no circumstances under which tact and judgment are so necessary as in the management of hyperæsthetic patients, who at the same time lack self-control, and possibly, also, intelligence and other qualities of the higher order. Accurate knowledge, which confers the power of correct prognosis and the right to speak positively, together with great patience, are very desirable qualities in the surgeon in this contingency.

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[1] Reliquet, "Traité des Opérations des Voies urinaires," Paris, 1870, p. 502.

[2] "Practical Lithotomy and Lithotrity," London (second edition), 1871.

But the disturbance of nerve-power may be confined to the bladder alone, in the form of atony, or impaired power of contraction; and this may be developed, as a consequence of the operation, slowly and partially, or, in rarer instances, suddenly and completely. Retention under these circumstances might be aided by tumefaction of the mucous membrane of the neck of the bladder and prostatic urethra from instrumental contact during the operation, a condition which is no doubt always present in some degree, accounting in part for the delay in the early passing of fragments. It usually subsides promptly, but sometimes is sufficient, with the addition of defective expulsive power, to prove obstructive. It is well to be on the watch for retention from these causes, especially as it is liable to come on insidiously some days after the operation. The treatment required is the introduction of a soft, flexible catheter, to evacuate the urine, and this should be repeated at proper intervals. It is desirable, in most cases, that the patient should be taught to pass the instrument for himself. If the irritation present be moderate in degree, a warm-water injection may be employed once a day by the surgeon, to assist the escape of detritus, if necessary. The tone of the bladder is improved by gradually lowering the temperature of the water injected, and, by judicious management in this way, this form of atony not unfrequently gets well.

Hæmorrhage, to a trifling extent, occurs not unfrequently after the crushing operation, and requires no notice. When severe, the possibility of tumor, or villous growth, is to be borne in mind.

Thompson details a fatal case of hæmorrhage from the bladder, from this cause,[1] and another in which, after careful *post-mortem* examination, no cause could be discovered, except that "the whole mucous membrane of the bladder was greatly congested." An instance of very free hæmorrhage on attempting lithotrity is also recorded by Aston Key,[2] in which it was judged proper to proceed at once to lithotomy. These, however, are rare cases. Hæmorrhage, occurring in connection with lithotrity, requires usually nothing more than increased circumspection in the management of the case, and is not likely to interfere seriously with its successful result.

Epididymitis and *orchitis* are liable to explode at any time during the progress of a case of lithotrity, usually, but not necessarily, on the occasion of some slight additional violence—such as that produced by the stoppage of a fragment in the urethra. This complication occurs infrequently, and in most instances unexpectedly; the reason why it should happen in only one case in twenty, with apparently similar provocation in all, not being always easy to explain. It subsides under

[1] *Op. cit.*

[2] "Guy's Hospital Reports."

the usual treatment in a few days, involving simply delay in the progress of the case.

Urinary Fever.—In the after-treatment of lithotrity, or in fact throughout the whole management of a case, there is no phenomenon which so promptly arrests the attention of the surgeon as the occurrence of a chill, and there is nothing in the way of a complication more likely to happen. Its suddenness, the invariable unexpectedness of the invasion, and, above all, the element of doubt as to its significance, give great interest to this symptom. It is usually followed by fever, terminating in more or less profuse perspiration, and, in a few hours, by a return to the usual conditions of health; and, also, by some loss of weight and strength, with a tendency to repetition. In the great majority of cases it has no serious import (Thompson). It is what is called in common parlance a "nervous chill." By this we understand that it is not the initial symptom of an attack of acute inflammation, or of pyæmia. Chills of this sort occur more readily in individuals who have passed middle life, and seemingly in those who have been exposed to sexual irregularities, or to malarial poisoning.

For urinary chill the treatment required during the paroxysm is the same as that applied in ordinary ague. All means should be used to promote free sweating—for this reason especially, that the shock to the nerves of the urine-secreting organs has for the moment impeded their eliminating function, and the vicarious action of the skin can with least delay supply their defalcation. The free use of the sulphate of quinine has a certain degree of power to prevent the recurrence of urinary chill. It is approved practice to administer ten grains or more, immediately after an operation, as a prophylactic, in a case where a previous operation has been followed by chill. There is no absolute regularity in the periodical recurrence of urinary chills, as in chills due to malarial cause. Like those of pyæmia, they are irregular, not only in the period of their recurrence, but also in regard to severity, duration, amount of febrile reaction, and subsequent sweating. It is obvious, therefore, that an opinion as to the significance of a urinary chill can only be formed after patient waiting, and most careful observation. The surgeon should know what dangers the occurrence of the chill might foreshadow, and watch for these. Probabilities would favor an invasion of acute cystitis, suddenly superadded to the partial chronic inflammation already present, in some degree, in every case of stone. This would tend to involve the whole body of the bladder, starting from its neck; and, in an old or broken-down subject, it might extend through the ureters to the pelves of the kidneys and their secreting structure, leading to the worst result. At first the presence of this complication would be indicated by pain on pressure over the hypogastrium, with sustained frequency of pulse; and afterward, in a grave case, by dry tongue, jactitation, and symptoms of anæmia. Hot fomentations and mustard-poultices to the lower belly, absolute quiet, opium in suppository or subcutaneously, quinine, demulcents, and systematic nourishment, are the principal remedial measures. If there are large and sharp fragments in the bladder, the pelvis should be kept elevated; and, if the symptoms tend to assume a chronic character, the propriety of recourse to lithotomy is to be considered without delay.

An invasion of cystitis, after lithotrity, resembles very much, in the group of phenomena which it presents, and their extreme urgency in some cases, the symptoms caused by the impaction of a fragment in the urethra. In fact, the conditions are very much the same; the presence of uncontrollable spasm, threatening mechanical injury to the surfaces in contact with rough stone fragments, being the leading feature in both. The patient suffers constant and severe pain in the bladder, perinæum, and anus, and every few minutes the urine, mingled with pus and blood, is expelled with irresistible desire and urgency, and with pain of still greater sharpness, while his agitation and nervous excitement are steadily increasing, and, with them, the danger to the bladder. In both conditions the first indication is to control the spasm, if possible, before serious injury has been produced, and for this purpose opium is the most reliable means, aided by chloroform, if necessary, to secure more instantaneous effect. If the urgency of the symptoms is not promptly subdued by this treatment, the next step is to remove the source of the danger—the sharp, irritating fragments. The mode of procedure where fragments are impacted in the urethra has already been detailed. When it becomes necessary to remove fragments promptly from the bladder, one of the several methods of lithotomy is to be employed. It is obviously the duty of the surgeon, on the occurrence of symptoms, after lithotrity, looking toward an invasion of acute cystitis, to determine at once if they are caused by the impaction of a fragment at the neck of the bladder, or in the prostatic urethra. This can only be done by introducing a proper instrument into the bladder. Sometimes, by thus pushing a fragment back into its cavity, all urgent symptoms will cease at once. This proceeding is better accomplished under the influence of an anæsthetic. If no fragment is found in the urethra, the diagnosis of threatened traumatic cystitis is established. Opium should be administered to replace the anæsthetic, and if the cystitis cannot be controlled promptly, lithotomy should be resorted to without hesitation.

Two things are clear, then, when excitement of the bladder, attended by spasm, comes on soon after the operation of lithotrity, whether chill be present or not: that there is danger of serious cystitis and suppurative inflammation, with indefinite extension; and that prompt and intelligent action is required at the hands of the surgeon to avert this possible result.

Chill does not necessarily precede this train of symptoms. When it occurs later, during their progress, it is suggestive of parenchymatous cystitis, with formation of abscesses in the thickness of the bladder-walls; of abscess in the prostate; of peri-cystitis; of formation of abscesses in the secreting portion of the kidneys. With the possibility of these dangers awaiting the patient, which lead almost certainly to fatal results, it will be readily understood why prompt recourse to lithotomy is advised in uncontrollable cystitis, following the crushing operation. By removing at once the cause of irritation, it offers the better chance of safety to life.

Where old and latent pyelitis has possibly preëxisted in a case, it is liable to be stimulated into renewed activity after an operation of lithotrity. This condition would be indicated by pain on pressure over one or both kidneys, with a well-marked hectic movement, preceded by a chill—than which there is no more unpromising group of symptoms.

It is possible that the chill may indicate commencing pyæmia. The continued and increasing frequency of the pulse and altered aspect of the features, with the other peculiar characteristics of this grave condition, will serve to identify it. Although grave, it is not necessarily fatal. Abscesses may form in accessible situations, and the patient survive, after a struggle. When the larger articulations or serous cavities become involved, there is little hope.

The pulse may become frequent, and remain so, without the occurrence of any preceding chill, which, for example, is an exceptional occurrence in fever from septic poisoning. Absorption of putrid material into the blood gives rise to a train of characteristic symptoms with which the surgeon of the present day is tolerably familiar. The coincidence of recent abrasion of the mucous membrane with purulent and decomposed urine presents a combination of conditions favorable to the occurrence of septicæmic poisoning. Yet this grave form of disease is not common in our country—much less so than the writings of recent French surgeons would lead us to infer that it is with them. The "intoxication urineuse"—a phrase first popularized by Velpeau—so constantly referred to with apprehension, would seem to include pyæmia and inflammation of the urinary organs, complicated with uræmia as well as septicæmia. These serious conditions might undoubtedly coexist in the same case under the influence of unfavorable circumstances, such, for example, as aggravated hospitalism, but such coincidence is rare. In order to preserve a clear perception of the pathological influences due to lesion of the urinary organs, which may affect a patient exposed to danger, as after lithotrity, it is well to bear in mind that the epithelium of the bladder, when intact, is a safeguard against absorption, as demonstrated by the experiments of Susini;[1] and, also, that because altered urine, when extravasated, produces death of the connective tissue with which it comes in contact, it is not therefore equally fatal to life if absorbed in minute quantity into the blood. There are vague opinions held on these subjects which are well expressed in the language of Velpeau's famous lecture, already referred to—not improbably inspired by it—and which, like all vague ideas, tend to perpetuate impressions both incorrect and exaggerated. (For URINARY FEVER, *see* p. 45).

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[1] "De l'Impermeabilité de l'Epithelium vesical," Thèse de Paris, 1867.

LITHOTRITY IN CHILDREN.—The use of the knife for the cure of stone in children is so prompt, so safe, and, through the aid of anæsthesia, so free from pain, that below the age of twelve lithotomy is justly regarded as preferable to the crushing operation. There are no statistics of the results of the crushing operation in children which present results as favorable as those of lithotomy. Lithotrity has, then, but very doubtful advantages to claim over the cutting operation in early life. On the other hand, there are at least two serious disadvantages which experience has proved to be inseparable from it. These are the great liability to impaction of fragments in the urethra, through the absence of any prostatic impediment before puberty, which permits the vigorous and continuous contractions of the young bladder to force them irresistibly through its funnel-shaped and dilatable neck, into the urethra, without hinderance, and the danger of peritonitis in early life, rendered greater by the anatomical facts that the bladder lies so much more in the cavity of the abdomen, and is more largely invested by the peritonæum, than in the adult.

The manœuvres of lithotrity are in all respects the same in the child as in the adult, and, by employing an anæsthetic, the manipulations of the operation can be effected with equal facility; modern instruments can be made sufficiently strong and of sufficiently delicate proportions for the smaller urethra of the child; and its flexibility and tolerance of pressure in early life fully compensate for the greater sharpness of its curve; but, still, the very serious objections just stated remain in full force, and no means suggested by experience have thus far succeeded in removing them. The extravagant and uncontrollable paroxysms of spasmodic contractions of the bladder, which are so characteristic of stone in the child, will almost certainly force fragments into the gradually-narrowing passage. These paroxysms, when they have become habitual, will recur inevitably after an operation of lithotrity, performed under the influence of ether or chloroform, and with increased severity as soon as the anæsthetic influence has subsided.

This objection loses its force in a case where the stone is small enough to be thoroughly reduced to powder at one sitting, which is not unfrequently the case where the existence of the disease has been discovered early; and these are, in fact, about the only cases in which lithotrity is to be preferred in children. The temptations which anæsthesia offers to the surgeon to prolong the operation, with the object of thoroughly pulverizing a small calculus at one sitting, must not influence him too strongly, however, for the liability to peritonitis is one of the important exceptions to infantile tolerance of surgical operations. As a rule, the older the child the better, as the parts are more developed, but it is noticeable that children with stone tend to remain long undeveloped, in consequence of the disease. The cases so frequently encountered among the poor, where calculus has existed almost from birth, and the child has reached the age of puberty, are best treated by lithotomy. Chronic peritonitis[1] as well as chronic pyelitis, may exist, and relief by the knife is the best treatment.

LITHOTRITY IN THE FEMALE.—It would be naturally assumed, in consequence of the more direct approach to the stone through the short and capacious urethra, and the easy escape of fragments after the operation, that lithotrity is more easily accomplished in the female than in the male. But, in practice, this is not entirely true. There are certain peculiarities in the shape and relations of the female bladder by which these obvious advantages are, in some degree, neutralized. The uterus, which lies immediately behind, and in contact with it, if enlarged or misplaced, interferes both with its shape and its capacity for uniform distention. In women who have borne children there is usually more or less prolapse of the anterior wall of the vagina, and the bladder is necessarily, through its close attachment, dragged down with the relaxed vaginal wall, so as to project, in extreme cases, even through the vaginal outlet. In every case the uterus projects into the cavity of the bladder from behind to some extent, when the cavity of the latter is distended; and this prominence is usually in the median line so as to give rise to what Civiale describes as a *bas-fond* on either side of the central prominence. In the young woman the urethra and neck of the bladder are on a level with its floor, but, as the lithotrite enters its cavity, no smooth, fixed, inclined surface is recognized, such as that presented by the trigone in the male; and, later in life, there is a distinct tendency to the formation of a depression or *bas-fond* at the base of the bladder, by which the inferior margin of its outlet at the neck is thrown into relief; in this depression the calculus is usually found. Thus, the manœuvre so successful in the male, of elevating the pelvis so that the stone rolls backward to a point at which the angle of the lithotrite must necessarily strike it in gliding down the trigone, is not so readily accomplished in the female. In a woman who had borne children it would be necessary, more likely, to reverse the beak of the lithotrite, and engage the calculus between its open jaws by means of a finger in the vagina, by which the floor of the bladder could be lifted up. Another, and more trifling impediment, is the unfavorable situation and narrowness of the urethral orifice, which, less easily managed than that of the male, often refuses to admit the beak of the lithotrite without special care in manipulation. On the whole, then, the female bladder, having no prostate at its outlet to serve as an impediment, and no trigone at its base with external attachments to form a fixed floor, contracts more uniformly upon its contents, and expels them, through the short, large urethra, more fully and promptly than the male bladder, especially in early life. Later, however, it is liable to become irregularly dilated, especially at its base, to lose contractile power, and possibly to incur displacement; thus, the finding of small calculi and last fragments is not unlikely to be attended with difficulty. But for the large calibre of the female urethra, impaction of fragments would frequently happen, for the uniform and continuous expulsive effort resembles that of the male before puberty, where there is no prostate to interrupt it; and, by reason of the greater nervous excitability and liability to paroxysms of spasmodic contraction in the female, this accident does occur more often than would be thought probable. In such event the manipulation required for the removal of the fragment would be attended with less difficulty than in the male. For obvious reasons the employment of anæsthetics in lithotrity, in women, offers advantages which, in the hands of the judicious surgeon, are counterbalanced by no dangers which would justify their rejection.

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[1] The following case, reported by Reliquet (*op. cit.*, p. 626), is valuable as evidence afforded, by *post-mortem* examination, of the morbid appearances in a fatal case of lithotrity in a child:

"In the hospital service of Prof. Richet I lately watched the treatment of a little boy with stone. He was fifteen years old, but looked no more than eight or nine. He suffered with very frequent and severe attacks of spasm in urinating, in which his efforts in straining would bring down a large prolapse of the rectum, which would go up again, however, as soon as the attack passed off. The following description of the peritoneal *cul-de-sac* was sent me by M. Hybord, house-surgeon, who made the autopsy: 'The peritonæum covering the intestines and the internal surface of the abdominal wall shows no evidences of change, but that covering the bladder and reflected upon the rectum is deeply colored. At points it is very red and injected, and the vascular injection involves especially the sub-peritoneal connective tissue, the surface being smooth, without trace of false membrane, or even loss of transparency. On the front and sides of the rectum the vascular congestion is more intense than elsewhere, showing still the course of the smaller vessels deeply stained in red, although the specimen has been a good while in alcohol. The recto-vesical *cul-de-sac* is unusually large; the peritonæum covers not only the seminal vesicles, and prostate entirely, but extends an inch and a quarter below the apex of the latter; on the front of the rectum it descends to within a half-inch of the anus, and, when the finger is carried well down into the *cul-de-sac*, it reaches to within less than this distance of the cutaneous surface of the perinæum.'"

CHAPTER XVIII.

LITHOTOMY.

Preventive Treatment of Stone, General and Local.—Solvent Treatment of Stone.—Electrolytic Treatment.—Lithotomy.—Selection of Cases based on Statistics; the Condition of the Patient; the Condition of the Stone.—Choice of Operation.—Description of Operations.—The Lateral Operation.—Instruments employed.—Modification required for very Large Stones.—After-Treatment.—Lateral Operation in Children.—The Median Operation.—Supra-pubic Operation.—Complications of Lithotomy.—Relapse after Lithotomy.

As has been already amply set forth, there are two methods of formation of stone in the bladder: one, where a kidney-stone lodges and grows in the vesical cavity;[*] the other, where from obstruction (enlarged prostate, stricture), or other cause (atony), there are stagnation of urine, partial decomposition, with precipitation of crystals and amorphous salts, and a consolidation of the latter by mucoid pus at once into a nucleus of stone. As both of these causes are readily detected by the skilled surgeon, the question naturally arises, What can be done in a prophylactic way to prevent the formation of stone in the bladder, where the tendency is believed or known to exist? Very much can be done; an attempt will be made in the present section to show how much, and in what manner. The prevention of stones forming upon a nucleus (foreign body) which has been introduced from without is hardly worthy of consideration. A foreign body of this sort, when known to exist, should be at once extracted.

Stone, as found previously to advanced life, is, for all practical purposes, always a stone of uric acid. Thompson[1] says: "Nineteen out of every twenty of such stones have uric acid for their basis, the remaining one in the twenty being oxalate of lime;" hence it is evident that, to prevent stone of this class, such measures should be brought to bear upon a patient, who is known to have a calculous tendency, as militate against the formation of uric acid in the kidney. This formation of uric acid is the result of imperfect assimilation of food, coupled with faulty elaboration of the blood, such as exists in all patients having the gouty diathesis. In this way stone becomes hereditary, and the tendency to gravel is transmitted from father to son, from generation to generation. The connection between gout and calculus is more strongly maked by noticing the other maladies from which patients with gravel suffer, and by observing the occasional well-marked instances of interchange in the type of the symptoms in a given case; as, the disappearance of habitual gravel being marked by an outbreak of the gout. Not every patient with gout has stone, but the tendency to over-acidity of urine in gouty individuals is very marked, and habitual deposits of urates, uric acid, or even attacks of gravel, are by no means uncommon. Hence in patients, where the gouty diathesis is marked, care should always be particularly bestowed upon the condition of the urine.

Such patients will often be found to suffer from nephralgia, to have pink deposits, or red sand, in the morning urine, perhaps throughout the day. The alkaline tide, which should be observed two or three hours after each meal, will be feeble, perhaps inappreciable, on account of its mixture with the strongly-acid urine already in the bladder in small quantity when the tide comes on. Such a patient is ripe for stone. After a profuse sweat on a hot day, after a dinner out, with a free supply of wine, after some passing febrile disturbance, or hepatic congestion, leading to an increased supply of uric acid, already present in excess, a few crystals, larger than usual, start into existence in the heavy mother-liquid in the pelvis of the kidney, become joined together, rapidly increase in size, and the patient has kidney-stone, liable at any moment to pass into the bladder, and, remaining there as a nucleus, to be built up into a calculus of large dimensions—a monument of neglect of prophylaxis.

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[1] "Preventive Treatment of Calculus," 1873, p. 10.

The methods of treating over-acid urine, and battling against the tendency to the formation of stone in the kidney, will be detailed under the head of *nephralgia* from over-acid urine, and when describing the treatment of *kidney-stone.* The same rules hold good here. What prevents kidney-stone, prevents bladder-stone as well. The habitual use of Vichy or other alkaline water as a daily beverage in moderation (the harmlessness and efficiency of citrate of potash have been especially demonstrated by Roberts's experiments noticed page 367); the free imbibition of fluids of all sorts; a draught of water between meals, and on retiring, to dilute the acid tide of the urine of fasting—these means, habitually employed, aided by intelligent hygiene, and attention to all the functions, will serve in a marked manner to keep the urine normal. Muscular exercise should be encouraged in every possible way, and life in the open air. Where the patient's pursuits in life are of a sedentary nature, dry friction of the skin with hair gloves, exercise with Indian clubs, or even dumb-bells, practice in a gymnasium, or with a lifting-machine, are all substitutes of great value, where nothing better can be obtained.

When, from any cause acting temporarily, there seems to be a sudden tendency to aggravation in the morbid condition of the urine, when the liver seems to be torpid, and especially if the bowels are a little sluggish, nothing is more useful than a course of a few weeks of some mineral water containing the sulphate of soda. This salt has the power of sweating the intestine, and relieving the kidney from overwork, while it freshens the activity of the great abdominal glands, and, serving as a laxative, still proves at the same time a tonic, not being followed by any prostration, but, indeed, aiding digestion.

The best method of administering sulphate of soda is in a natural mineral water. Thompson[1] has proved by experiment that the solutions prepared by Nature far surpass, in effect, the same draughts concocted by the apothecary. He evaporated down slowly in a water-bath a purgative dose of one of these waters, and found the effect of the dried residue to be far inferior to the original solution; nothing more, in fact, than what would be produced by the same drugs mingled by the chemist.

The mineral water which seems to be the most useful is the Friedrichshalle water, of which the active ingredients are sulphate of soda (gr. 58) and of magnesia (gr. 49 to the pint). The proper dose of this is about seven ounces, with two or three ounces of hot water, enough to make the whole pleasantly warm—to be taken an hour before breakfast in the morning. This will usually produce one or two pleasant stools, an effect far out of proportion to the quantity of the drug taken; while another agreeable feature of this water is, that its effect usually remains the same while the daily dose is being gradually diminished. The hot water is added to bring the draught up to the natural temperature of the body, as well as to dilute it slightly, for the water is condensed to a uniform standard for exportation.

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[1] "Preventive Treatment of Calculus."

This morning-dose may be continued indefinitely without detriment, and when intermitted does not leave constipation behind. Thompson advises that, after having taken this water for several weeks, it should be mixed with Carlsbad water and hot water in the proportion of five or six ounces of Carlsbad to three or four each of Friedrichshalle and hot water—this to be continued for several weeks, and then the course to be terminated by a couple of weeks of Carlsbad alone (℥ v–viij) raised to a temperature of 90° or 100° Fahr., by placing the tumbler which contains it in hot water.

These expedients are all useful, and most excellent to meet emergencies, in the prevention of kidney-stone, but final reliance in all cases must be placed upon intelligent hygiene, in which exercise, air, and elimination by the skin are to be primarily considered. The food should be rather light, plain, mixed, containing a large share of green vegetables and fruit, as well as cereals, from the fact that the latter contain a large amount of alkaline phosphates. Alcohol and sugar should be avoided—as well as an excess of fat (Thompson). Attention to the above expedients constitutes the preventive treatment of stone due to blood-conditions.

Local Preventive Treatment of Stone.—The second class of stones, as ordinarily encountered, are due to local origin. They depend on stagnation of urine, and inflammation of the mucous lining of the bladder, attended by decomposition of urine. Such stones are found in old men, with enlarged prostate and atony, in cases of old stricture, etc. They are composed of the mixed phosphates (fusible calculi), and often grow very rapidly.

The subject of their prevention has been already mentioned at length, in connection with the different morbid conditions liable to give rise to atony, with stagnation, and the means to avert the threatened complication, stone, have been amply detailed. To recapitulate, these means are:

1. To overcome all obstruction to the free outflow of urine, if possible, as in the removal of stricture by dilatation.

2. To reduce vesical inflammation, empty the bladder periodically, and wash out its cavity by means of the regular gentle use of the catheter in all cases where, from atony, or paralysis, or obstruction (large prostate), the viscus cannot empty itself; employing warm water in injection, and any of the medicated fluids suggested at page 197). If the stone has been already crushed, an injection of two or three drops of dilute

nitric or hydrochloric acid to the ounce of warm water, during and after the treatment, is advisable to oppose any continued precipitation of the phosphates.

Solvent Treatment of Stone.—This method, undoubtedly effective in many cases of kidney-stone, is practically powerless to contend with vesical calculus. If stone in the bladder is large, it would be folly to attempt to dissolve it either by internal medication or vesical injection. Efforts in both of these directions have been made for centuries, but in no single reported case with demonstrated success. In all of the cases reported cured, where calculus was detected by a competent authority, before the treatment, when an examination after death could be obtained, the bladder was still found to contain stone. The most brilliant example of this kind is found in the fact that the four patients, whose cures were certified to by the trustees appointed by government to examine into the merits of Mrs. Joanna Stephens's remedies, were each found to have stone in the bladder when they died.[1] Mrs. Stephens's remedies, which were purchased by the English Parliament in 1739, for £5,000, consisted chiefly of snails, ashes, egg-shells, and soap—that is, the alkalies, potash, and lime. If a stone is small enough to be managed by any solvent treatment, it is much more speedily and effectively dealt with by one or two crushings.

Electrolytic Treatment of Stone.—Efforts in this direction, although effective for small calculi, are utterly unpractical. It must require more time and give more pain to find the small stone, get it between the poles, and act upon it by electricity, than it would to crush and destroy it in one or two sittings.

LITHOTOMY.

In the consideration of the treatment of stone, the subject of lithotomy is introduced last, because it is an operation of far less importance than its powerful rival lithotrity: to the latter it is yearly yielding more and more of the cases which, by common consent, formerly fell solely within its own domain. That lithotomy is an important operation, and eminently surgical, is undoubted; that it requires a cool head and steady hand for its proper performance, none will dispute; that it is often brilliant in its results is equally self-evident; but the function of the surgeon is not to perform brilliant operations, but to cure disease and relieve pain with as little risk to life as possible, and this lithotrity accomplishes far more certainly, in many cases, as has been shown when dealing with that subject. As the means of diagnosis improve, and become more widely spread, stones are detected earlier, and yearly the number of calculi is greater which come within the scope of lithotrity—an operation which, carefully and gently performed, upon a proper subject, is nearly as harmless as passing a catheter. Lithotrity owes its present exalted position largely to the untiring, honest, and able efforts, during the present century, of Civiale and Sir Henry Thompson.

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[1] Quoted by Thompson, from Alston's "Lectures on Materia Medica," 1870

But not all stones and not all patients are suitable for lithotrity. Lithotomy still holds its place as one of the grandest operations of surgery, and still has no rival in at least fifty per cent. of all cases of stone, taken collectively, at all ages.

Lithotomy is respectable for its longevity; but it is idle in a text-book of the present day to discuss the unfavorable opinion of Hippocrates, who believed that wounds of the bladder were deadly, or the barbarous method of "cutting on the gripe," the "apparatus minor," or the "apparatus major" of musty antiquity. Nor, again, does space allow a detailed description of the many cutting operations which have been proposed and successfully performed for the removal of stone from the bladder—operations bearing the names of many illustrious men, and modifications of these the names of many more, to whom all honor is due. Practically, the surgeon requires but three operations to meet the necessities of all cases, and these three only will be described at length —they are the lateral, the median, and the high operation for stone.

Selection of Cases.—After the thorough discussion of this subject in connection with lithotrity, already given (p. 273), but few words are necessary here. If the patient's condition will allow any operation, and it is not considered wiser, on account of the size of the stone, the age of the patient, or other circumstances, to palliate and make life comfortable, without the risk of an operation, which indeed may often be done for those who are wealthy and surrounded by ease and luxury—if, then, an operation is decided upon, lithotrity is to be practised, when feasible; otherwise one of the operations of lithotomy. The age of the patient assists largely in arriving at a conclusion. As a rule, all children under the age of fourteen are to be cut, unless the stone is so small that it can be reduced to powder at one, or, at most, two crushings, under ether. This rule is founded on the universal experience of practical surgeons as well as upon a study of statistics. Statistics, as a rule, are utterly false guides, as far as showing the true state of affairs in lithotomy is concerned, and their collection does not demonstrate absolute truth. The statistics of one man are all selected cases; another surgeon, though distinguished, may, for that very reason, have had an exceptionally large number of difficult cases to attend to, and consequently his results might be defective guides. Statistics, again, are sometimes largely of hospital, at others of private patients. In the same way the statistics of special operations are not free from chances of error. The excellent showing of the median operation in America (especially the successes of Markoe, Little, and Walter, the statistics of which, as recently published,[1] give 139 cases with five deaths, one in 27⅘), forms a brilliant contrast with the results of Dupuytren's bilateral operation, having a mortality of one in 4½ cases,[1] or of the recto-vesical one in 5, or the supra-pubic, one in 3½ (Humphrey). These statistics are none of them finally conclusive; for, as a rule, small stones are selected for the median operation, and the largest for the recto-vesical and the high operations, and, had the cases operated on by these latter methods been subjected to the median section, the mortality would undoubtedly have been enormous; while, if the patients who recovered under the median operation had had their small stones removed by other and severer methods, many more of them undoubtedly would have died.

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[1] J. W. S. Gouley, *op. cit.*, p. 347.

The general statistics of all operations, at all ages (of which several have been collected, numbering thousands of cases), give a general mortality of about one in 6½ to one in 11. Statistics of the lateral operation alone are much better, and of the median best of all—except the brilliant results obtained by our countryman Dudley, of Kentucky, who, out of 207 cases of lithotomy, only lost six, or one in 33½ cases. The late Valentine Mott was also a very skillful and successful operator, but he has left no record of his results. Gross, in 115 operations of his own, has a mortality of one in 11½.

The most valuable statistics, however, possessed by the profession, are those of Thompson.[2] They include 1,827 cases. These cases, collated from English operators, show a general mortality of one in eight cases, and that, too, although the reports of certain eminent gentlemen were refused, as containing sources of error. But, that this estimate of one in eight is utterly useless for practical purposes, Thompson shows, by an analysis of the cases according to their ages. He found that one-third of the cases occurred during the first seven years of life, one-half before the end of the thirteenth year. The average mortality under twelve years was one in sixteen cases for all operators, a result which lithotrity, viewing its difficulties in the young, could scarcely equal. Between twelve and sixteen, puberty comes in to increase the mortality to one in 9½ cases, after which it again decreases. Hence it becomes a matter of personal judgment in cases between twelve and twenty—the stone itself being suitable—whether it would not be better to crush. After twenty, in all cases, where neither the stone nor the condition of the patient contraindicates it, lithotrity is to be preferred. Between twenty-one and forty-eight inclusive, Thompson's statistics of lithotomy show a mortality of one in 8⅙ cases; and, from forty-nine to eighty-one inclusive, one in 3⅔ cases.

To briefly recapitulate: the conditions of the *patient* requiring (with the rarest exceptions) lithotomy, when his age, and the size and character of the stone, would seem to call for lithotrity, are only four:

1. Peculiar susceptibility, where the patient is liable to have a chill after the introduction of any and every instrument into his bladder.

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[1] Eve, of Nashville, only had eight deaths in eighty-seven operations, one in 10⅞.—"Transactions of the American Medical Association," 1871.

[2] "Practical Lithotomy and Lithotrity," second edition, 1871.

2. Where the grade of vesical inflammation is high, and gentle manipulations with instruments seem to increase it, or to produce much hæmorrhage. Here the lateral operation will usually put the bladder at rest at once.

3. Tight, *unmanageable* (resilient) strictures complicating stone.

4. Certain conditions of enlargement of the prostate, making it impossible to introduce instruments.

The conditions of the *stone* calling for lithotomy are four: size, number, composition, position:

1. *Size.*—If a stone is decidedly over medium (one inch diameter) size, and at the same time composed of any thing except the phosphates, if any operation is called for it is lithotomy.

2. *Number.*—Most cases of multiple stone do better if cut.

3. *Composition.*—If the stone is small, its composition is a matter of not much importance; if much over an inch, it is all-important. The constant appearance in the urine of uric acid, oxalate of lime, or the mixed phosphates, or the examination of gravel or small stones previously passed by the urethra (if any), will often throw great light on this subject, as will also the quality of the click when the exploring instrument strikes the stone, the sound being sharp and clear for hard, dull for soft stones.

3. *Situation.*—Encysted stones, if molested at all, require the knife. Severe general or local disease (especially cancer or Bright's disease), unnatural size of stone, advanced age, and debility, make it often advisable to palliate rather than assume the risk of any operation, especially among the wealthy, who can command every comfort. With large stones, in broken-down patients, Thompson estimates that cutting operations kill one out of three.

Choice of Operation.—Having now decided what cases of stone require lithotomy, it remains to discuss the circumstances calling for one or the other operation.

Young children do well by any operation, but the lateral is undoubtedly the best, as the incision is not liable to injure the seminal ducts and a free outlet is afforded for the extraction of the stone. If the latter is quite small, the median operation is perhaps as good; but, where it is large, the violence done in dilating the vesical neck is objectionable. It is exceedingly rare for children to have infiltration of urine, although the limits of the prostate are undoubtedly often surpassed by the incision in the lateral operation. Peritonitis from violence is what is to be feared in children, and there is little danger of this (even with large stones) from the lateral operation. The median section, however, in children, has the advantage of being generally attended by less hæmorrhage, and is useful for small stones; the older the child, the less objectionable the operation.

With the adult, the same rule holds good—the median operation for small stones, the lateral for large. But small stones in the adult are preferably dealt with by lithotrity; hence the application of the median method is rarely advisable, except under two circumstances, namely, where there are many stones, all small, and where, with a single small stone (less than one inch in diameter), the patient's irritability is such that chill or constitutional disturbance follows every attempt to use instruments in the bladder.

Where the stone is small or large, but the bladder more than ordinarily irritable and inflamed, the lateral operation, with free incision of the prostate and vesical neck, is to be preferred.

In the case of very large stones, and indeed as a matter of prudence for all stones over one and one-half inch diameter, a modification of the lateral operation is called for, namely, bilateral section of the prostate to make more room for extraction; or, if the stone shows exceptional proportions, the combination of crushing with cutting (perineal lithotrity) and extraction of the stone in fragments, or the supra-pubic operation.

The medio-bilateral operation of Civiale does not afford so good an external opening for the extraction of the stone as the lateral, with bilateral section of the prostate, and, according to Thompson, is attended by as great hæmorrhage. Bilateral external incisions present no advantages over the single lateral cut. Recto-vesical external incisions, though greatly facilitating the extraction of large stones, are nevertheless very likely to be followed by recto-vesical fistulæ. The recto-vesical operation, performed by opening the bladder through the rectum behind the prostate, leaving the perinæum untouched, and sewing up the incision afterward with Sims's silver suture, although it has been practised with success, is difficult of execution, and only applicable to stones which can usually be more safely dealt with by lithotrity.[1]

THE LATERAL OPERATION.

The lateral operation dates back to Pierre Franco, of Provence, about the middle of the sixteenth century, and claims the names of Jacques in the seventeenth century, and Rau, his pupil, in the eighteenth. It was popularized and practised with great success in England, by Cheselden, in the last century, and it is his operation which is still performed.

Instruments employed.—The instruments necessary for this operation are the searcher (Fig. 70), a staff of proper size with a long curve deeply grooved on its convexity (Fig. 100), the groove encroaching on the right lateral aspect of the staff toward the point. The handle of the staff should be broad, heavy, and marked with deep, crossed lines, so that it may be held firmly with greater ease. The groove should not run off at the beak, but stop abruptly, leaving the last quarter of an inch blunt and round. The scalpel should be firm, seven or eight inches long, with a stout shank, and solid back, the blade about three inches long (Fig. 101), the cutting edge about one and a quarter inch.

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[1] In the female, the vagino-vesical section is a good one. According to Emmet (oral communication), the wound, if kept clean by irrigation, heals promptly without suture; or, failing, it might be brought together subsequently with silver ligatures.

Blizard's probe-pointed knife (Fig. 102—*A*, English pattern), long, straight, with a stiff back, and (Fig. 102—*B*, American) a ribbed handle.

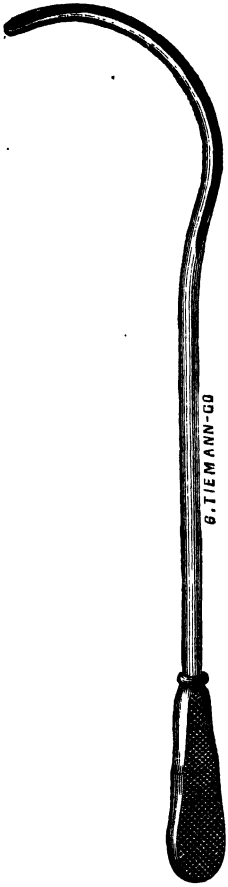

Fig. 100.

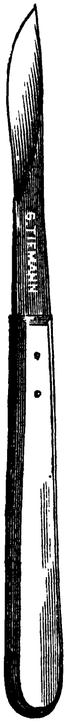

Fig. 101.

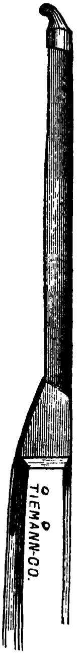

Fig. 102—*A*.

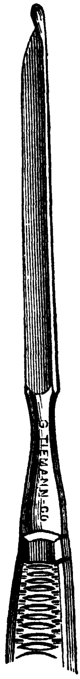

Fig. 102—*B*.

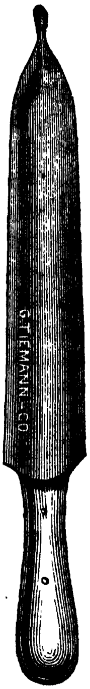

Fig. 103.

The blunt gorget, possibly useful where the patient is fat, and the perinæum deep (Fig. 103). The scoop (Fig. 104), several forceps of different sizes, with extremities roughened in the inside to hold the stone firmly, one with crossed handles (Fig. 105), so as to be opened sufficiently in a deep perinæum without stretching the wound unduly; another with its blades sharply curved (Fig. 106), so as to catch stones behind the pubes, or in the "bas-fond." A heavy pair of forceps, with a central raised ridge of heavy teeth pointing backward (Fig. 107) in each blade, to catch and break stones which are found to be too large to extract safely, with an extra screw for attaching the blades, and drawing the jaws together. For the same purpose an instrument known as Maisonneuve's (Fig. 108), having its female blade terminate in a deep scoop. It is used as follows: The scoop (*a*) is introduced carefully through the perineal wound until it has entered the bladder, after which, by a lateral motion, it is insinuated under the large stone. Now the male blade (*c b*), with its inner shaft (*e e*) withdrawn, is gradually pushed down against the stone, and screwed firmly by the wheel (*d*) until it holds the calculus fixed. Finally, the inner sharp "bit" at the end of the central shaft (*e*) is, by rotating the handle, driven through the stone (*e*), thus perforating it, and, by the assistance of the wheel (*d*), splitting it into fragments. A metallic tube, one-third inch diameter (Fig. 109), with an open end, and a large eye—furnished with an obturator for easy introduction—through which to wash out *débris*. Another tube, one-sixth inch diameter, provided with a globular head, about a half-inch diameter, having large holes in the globular head pointing backward (Fig. 110), and piece of rubber tubing on its proximal extremity—this to be used with

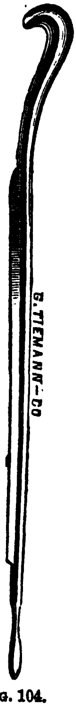

FIG. 104.

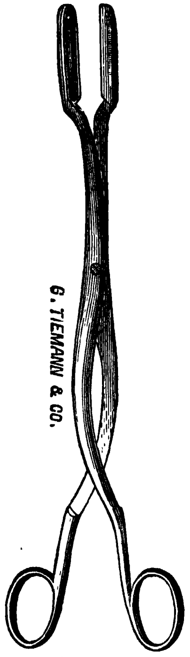

FIG. 105.

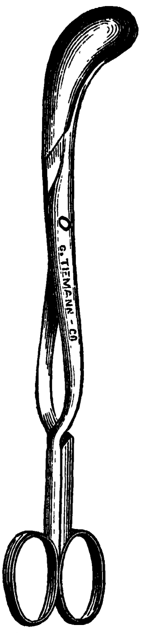

FIG. 106.

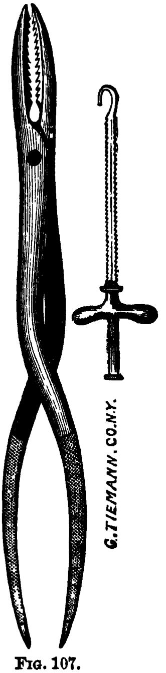

FIG. 107.

a Davidson's syringe to wash out *débris*. A shirted canula for hæmorrhage (Fig. 111), and a tenaculum which unscrews at the handle (Fig. 112, Keith's tenaculum), for the same purpose. Prichard's anklets and wristlets (Fig. 113). A soft French olivary catheter, brandy, hot and cold water, sponges, towels, ligatures, ether, etc. These make up the necessary list of instruments. At least five assistants are necessary: one for the ether; one to steady each knee of the patient; one—the post of honor—to hold the staff; one to sponge and act as general assistant.

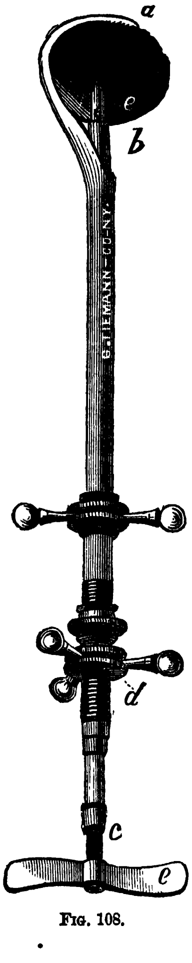

Fig. 108.

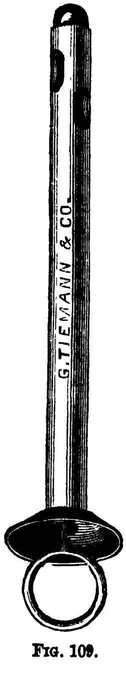

Fig. 109.

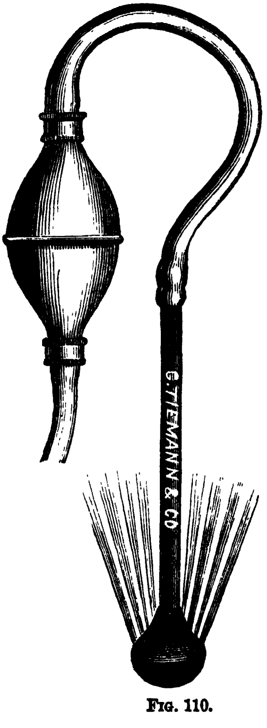

Fig. 110.

The Operation.—The patient is prepared beforehand as for any other capital operation, and in addition has the perinæum shaved and receives a full enema about two hours before the operation, to clear the rectum, after which he abstains, if possible, from again passing water.

He should be etherized in bed, and then carried to a small, firm table, and comfortably arranged on an old blanket. The anklets and wristlets are adjusted (or the hands and feet bound together with bandage). The pelvis is now drawn to the lower edge of the table, facing the light, a piece of old carpet and a pan with sawdust placed beneath to catch the blood and urine. The operator passes the staff, feels the stone with it, and then intrusts it to his assistant of honor, and, taking his seat on a low stool, facing the patient's pelvis, with all his instruments systematically arranged within easy reach of his right hand, is in readiness to commence. Should the staff fail to strike the stone, it may be withdrawn and the searcher introduced. Should this also fail to detect it, after a careful and prolonged sounding, the operation should be deferred. Some of the best operators have been deceived in their diagnosis, and have cut patients in whom no stone existed; so that it has become a cardinal rule never to cut a patient in whom the stone cannot be felt after he is upon the table. The sound may fail to detect it, if it lies in a deep *bas-fond*, but not so the searcher.

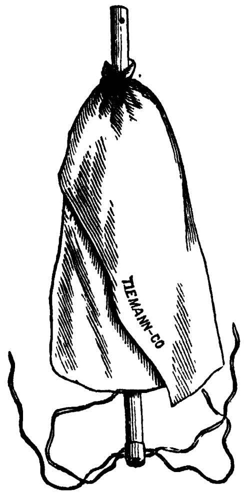

FIG. 111.

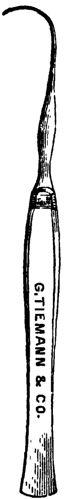

FIG. 112.

The holder of the staff usually satisfies himself that the sound strikes the stone. It is not essential that the end of the staff should rest against the stone. As long as it is certainly in the bladder, nothing more is required. The chief assistant stands at the patient's left, holds the staff vertically, steadily, and firmly hooked up under the symphysis, with its long curve a little bellied out in the median line of the

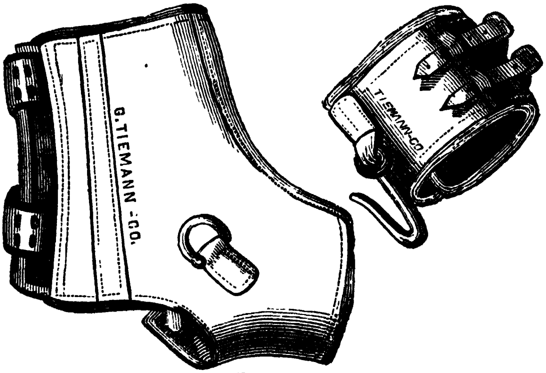

FIG. 113.

perinæum, and keeps the integument of the latter taut by pulling the scrotum up around the staff. The assistants steady the knees, while the operator impresses his mind finally with the shape and size of the long outlet of the pelvis by running his fingers down the rami of the ischium, touching their tuberosities, feeling the symphysis pubis, and the coccyx. The surgeon should picture to himself a pelvis lying before him, in position, denuded of soft parts (Fig. 114), and recall the general inverted heart-shape of its outlet (Fig. 115).

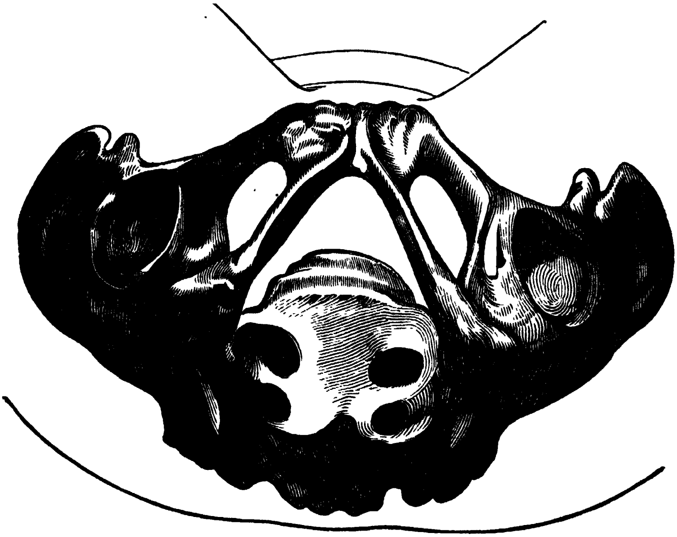

Fig. 114.—(*Thompson.*)

The operator now introduces the left index-finger into the rectum, assures himself that the sound enters at the apex of the prostate, and passes centrally through its canal, and that the rectum is empty and collapsed. Then, withdrawing his finger, he searches, with the thumb or finger of his left hand upon the raphe of the perinæum, for the groove in the staff, which, in a thin person, can always be obscurely felt. If he cannot feel it, he takes the handle of the staff from his assistant, and, by depressing it several times, while he makes pressure upon the perinæum, he satisfies himself of the position of the groove, and returns the staff to his assistant.

The scalpel is now entered a little to the (patient's) left of the raphe, from one and a quarter to one and a half inch in front of the anus, the point of the knife, guided by the nail, being made to enter the groove of the sound and open the urethra at the first cut. If the point enters the groove, it is to be pushed along for a quarter to half an inch—if it fails to strike the groove, it is made to pierce more or less deeply—and then, with a single bold stroke, the first incision is made laterally to the right, about three and a half inches long, terminating exactly midway between the tuber ischii and the anus. The scalpel is again entered into the groove, and the urethra amply opened. The practised lithotomist sometimes uses the same knife to complete the operation, but, as a rule, it is better, at this stage, to change the scalpel for Blizard's knife. The probed point of the latter, following the guiding index-finger, is passed into the groove, and the surgeon takes the handle of the staff, depresses it somewhat, and, following the groove, pushes his knife along until its point is arrested by the abrupt termination of the groove at the end of the staff. He now increases the angle between his knife and the staff by depressing the handle of the former, and, remembering the position and shape of the prostate, he cuts his way out, his incision through the prostate being at about an angle of 30° with the horizon, his external incision at an angle of about 50°. A glance at Fig. 115 shows at once the relation between the incisions and their relation to the prostate and anus. A gush of urine usually follows this incision. If the external incision has not been bold enough, it may now be enlarged with a few strokes of the scalpel.

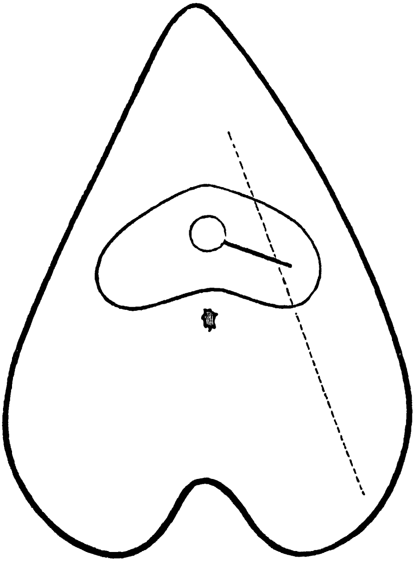

FIG. 115.—(*Thompson.*)

If the above directions are followed, there is little danger of that disagreeable accident, cutting into the rectum.

Instead of dividing the prostate with the knife, numerous ingenious lithotomes have been devised, which incise to a greater or less distance, according to a previously-arranged gauge, or can only cut to a limited extent, as in the bisector of Wood, and that of Post, of New York. The single-cutting "lithotome caché," of Frère Côme, and the double instrument of Dupuytren, with their many modifications, of which that of Briggs, of Nashville, is simple and efficient, all of these are undoubtedly good; but the surgeon should learn early to depend as much as possible upon his brains and his fingers, and as little as possible upon instruments, if he would acquire self-confidence, without which any operation for stone is unsurgical. Hence it is advisable for the young surgeon to familiarize himself with the use of the scalpel and Blizard's knife, and to do all his cutting with these instruments, or even with the scalpel alone, remembering that the greatest average lateral dimensions of the adult prostate are only one and a half inch, and that a depth of incision one-half, or at most five-eighths of an inch, into one side of the prostate should be a limit never surpassed—dilatation will do the rest.

Having now completed the incisions, the index-finger of the left hand should be gently introduced into the bladder, and the sound withdrawn. The finger usually comes at once in contact with the stone. The bladder's neck is now to be dilated slowly but thoroughly with the finger—if the perinæum be deep with fat, with the blunt gorget, carried in along the groove of the staff. If the stone has been previously measured, and is less than one inch in diameter, or if there are many small stones, the surgeon should proceed to extract at once. If, however, the stone is above one inch in diameter, Blizard's knife should be reintroduced on the finger, and the prostate cut on the (patient's) right side. After being satisfied that the neck of the bladder is nicked, the prostate sufficiently cut, the whole wound dilated and dilatable, the forceps is passed into the bladder as the finger is withdrawn. One blade is depressed into the floor of the bladder, the other is widely opened, and usually, on closing them, the stone will be caught. Failing in this, search laterally and further back in the bladder must be made, the direction of the blades being changed, until the stone is seized. In cases of deep perinæum the small end of the scoop is introduced until it touches a stone, and then the forceps is followed along upon the scoop as a guide until it enters the bladder and strikes the stone. It should never be forgetten during these manœuvres that the bladder, usually already much inflamed, is often nearly empty, clasping the stone, and that any roughness or force may inflict serious (perhaps fatal) injury upon the patient. The utmost gentleness, deliberation, and care are necessary during this stage of the operation; indeed, the catching and skillful extraction of the stone is often a more delicate proceeding than any other part of the operation.

If it is found that the stone has been seized in a faulty diameter, it should be dropped or pushed out of the jaws of the instrument, perhaps rolled over with the finger, and another attempt made to catch it correctly. Extraction should be slow, the traction being made in the line of the external incision, downward and outward. Lateral motions should be given to the forceps during extraction, the force being about two-thirds lateral, one-third extractive. It must be remembered that the most fatal source of danger in lithotomy is bruising and lacerating the neck of the bladder in forcible efforts at removing the stone; and, if, after the exercise of a sufficient amount of force—the amount to be learned only by experience—the stone will not engage in the outlet of the bladder, it is far more brilliant morally, and better surgery, to break the stone and carefully extract the pieces, than to remove by force a handsome specimen to show, with the risk of having to attach to its history, "Result fatal."

After one stone has been extracted, if it is found to be smoothly rounded and presenting no facets, there is probably no other present; if it has facets, the reverse is almost, if not quite, certain to be the case. Phosphatic calculi are often multiple, uric acid less commonly so, oxalate of lime often single. In any case after extracting one stone, careful search should be made for another with the searcher, and the small end of the scoop through the perineal wound. Should any stone break during extraction, and in those rare cases where a quantity of *débris* is found in the bladder, partly adherent to ulcerated patches of mucous membrane, the large end of the scoop is to be used to spoon out the earthy matter, and then copious injections of tepid water are to be thrown into the bladder with the Davidson's syringe through the large tube (Fig. 109), or the bulbous-headed irrigator (Fig. 110), until the bladder is clean.

When the stone is found to be encysted, or fixed in position by some faulty contraction of the bladder behind the pubis, or in the fundus, the dexterity of the operator may be taxed to seize it with the forceps, but intelligent efforts, gently and carefully prolonged, will usually overcome the difficulty. If the stone is deeply encysted, it may be impossible to liberate it. The neck of the cyst may be nicked in several places, efforts made to gnaw off any projecting portions of stone, and gradually to insinuate the narrow blades of a small curved forceps to extract it. Each case must be coolly studied out at the time; no definite rules, covering all contingencies, can be given.

VERY LARGE STONES.—Where the stone is found to be too large to extract safely, it must be broken, a procedure by no means modern, as it is referred to by Celsus. This is not an easy task in an irritated bladder, contracted about a large calculus. If the heavy-jawed forceps (Fig. 107) can be made to grasp the stone, it may be thus broken up. Should the large calculus slip from the bite of this instrument, the more formidable crusher (Fig. 108) may be resorted to, or an instrument devised by Civiale (Fig. 116), who employed it a score of times with extremely successful results.[1] The instrument is favorably mentioned by Thompson. Civiale employed it for stones weighing about one ounce and a half, and over. It is somewhat complicated, but serviceable. With one of these instruments the stone is to be carefully broken up, and the fragments removed with great circumspection, as their rough, broken angles are fertile sources of laceration and severe contusion. When practicable, any prominent sharp edge should be protected by the finger of the operator, on its way out through the soft parts. The *débris* is dealt with by syringing through a tube, as already described. Crushing a large stone *in situ*, although a serious proceeding, and necessarily jeopardizing the success of the operation, is nevertheless countenanced by high authority, and has proved wonderfully serviceable. Mayo, of Winchester,[1] extracted successfully by this process a stone weighing fourteen and a half ounces, which certainly could not have been otherwise removed.

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[1] "La Lithotritie et la Taille," Paris, 1870, p. 440, *et seq*

Hæmorrhage during the operation is rarely profuse. The lower part of the bulb is generally cut into. Spurting-points should be tied as they occur, or twisted. When the bleeding-point is deep in the wound it is difficult to tie, and removing the tenaculum may loosen the ligature. To meet such an emergency, it is proper to tie in a tenaculum, and for this purpose Keith's idea (Fig. 112), of having a tenaculum from which the handle may be unscrewed, is a good one. Thompson[2] says, "I believe I have saved a life on one or two occasions by tying in a tenaculum." In one instance the instrument was left in ten days, when it came away spontaneously. Gross's artery-compressor (Fig. 117) is suitable for the same purpose; the artery is seized and compressed, the handle unscrewed, and the blades left in the wound.

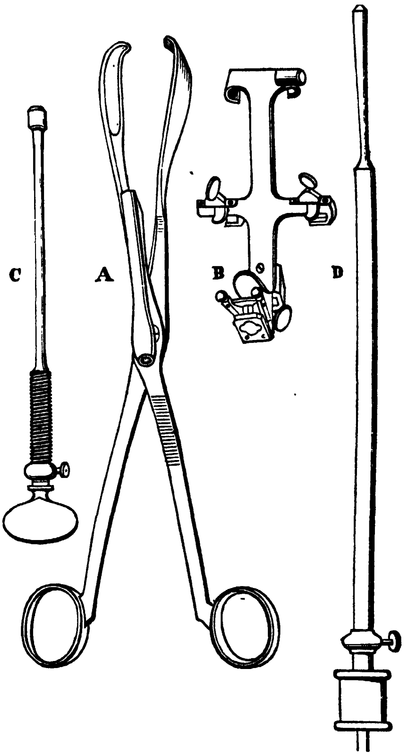

FIG. 116.—(*Thompson.*)

A, Forceps. *B*, Part to be fastened upon the forceps by screws. *C*, Part to be inserted through *B*. *C* steadies and fixes position of stone. *D*, Drill introduced through tube *E* is rotated to perforate and break up stone.

Digital pressure for several hours of the pudic artery against the ischio-pubic ramus may serve to arrest arterial hæmorrhage, otherwise uncontrollable. Ice and iced-water irrigation is an adjuvant which may be resorted to. Even the pudic artery may be tied by taking a short, stout, curved needle with a holder, introducing it through the soft parts close to the anterior border of the bone, bringing it out about three-quarters of an inch deeper, and then firmly tying the ligature which it carried.

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[1] "Med.-Chir. Trans.," vol. xi., 1821, p. 54.

[2] *Op. cit.*, p. 44.

Venous hæmorrhage, unless profuse, may be disregarded; if severe, it calls for plugging of the wound. This is effected with the "shirted canula" (Fig. 111), or any female catheter will do, with a sufficiently large square piece of muslin having a hole in its centre, tied firmly around the tube, at about an inch from the extremity which enters the bladder—or even a soft sponge perforated by a female catheter. This is introduced deeply into the wound, and the flaring sack around the central tube is closely packed with small pellets of lint, sponge, or oakum, the whole kept in place with a snugly-applied T-bandage.

Generally all oozing may be arrested by simply bringing the thighs together, and bandaging the knees, thighs, and ankles. The mutual pressure of the two surfaces of the wound answers admirably well.

After-Treatment.—If the patient seems to be sinking during or immediately after the operation, before he has emerged from his anæsthesia, and, consequently, when he cannot swallow, an excellent means of stimulating him consists in passing through one nostril a soft French olivary catheter (about size 8) past the pharynx into the œsophagus, and throwing into his stomach small doses of brandy with a syringe. The catheter may be left in during the whole operation, and does not interfere with the administration of the ether. One caution is necessary: It is prudent, before injecting the brandy, to notice whether any air comes out of the catheter during expiration, as the instrument may possibly have passed into the trachea; if time allows the slower absorption, injection into the rectum may be substituted. The patient is placed upon a mattress, with the hips upon a rubber cloth and folded compress, and napkins placed under him, which, by being frequently changed, indicate the amount of hæmorrhage. Urine passes freely at first through the wound, always more or less tinged with blood. The wound swells so much sometimes, before suppuration is established, that part of the urine on the second day flows through the meatus, or, indeed, retention may come on. The latter is relieved by gently introducing a female catheter or a finger through the wound.

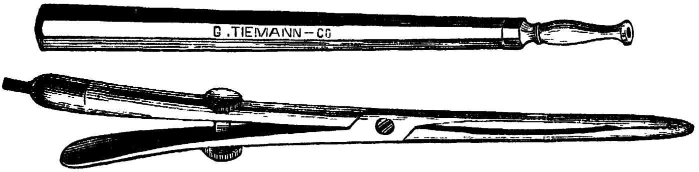

FIG. 117.

Opium may be given from the first to control pain, to be pushed judiciously on the appearance of any evidence of peritonitis. Diet should be light, but sustaining. If the patient has been addicted to stimulants, he should not be deprived of them in moderation, and the same is true of opium.[1]

The wound usually closes by granulation. As suppuration comes on, there is not infrequently a slight chill, with (surgical) fever, but the patient is, on the whole, comfortable, and delighted to be free from his old pain. Sometimes the wound becomes coated with urinary salts. This is prevented by frequent syringing with warm water, to which a few drops of dilute nitric acid have been added. (Certain *complications* are described after the median operation.)

LATERAL OPERATION IN CHILDREN.

In children the staff is smaller, with a shorter, sharper curve, as the bladder lies high; hence, the staff must be hooked well behind the symphysis. The incisions are made in the same manner as in the adult. The lower end of the rectum is often prolapsed in children with stone; this is reduced before the first incision, and kept in with the finger. There is little danger of cutting it, with the exercise of any ordinary care. The incision at the neck of the bladder usually, if not always, cuts entirely through the limits of the prostate, which is very minute before puberty, but it is a matter of no importance. Infiltration of urine does not occur after it. There is much more danger in making too small an incision, and lacerating and bruising the parts during extraction of the stone. The lateral incision of the prostate avoids the seminal ducts. There is danger in children, if the membranous urethra and bladder-neck have not been sufficiently cut, that an attempt to introduce the finger and dilate the latter may require so much force that the membranous urethra is torn across and the bladder pushed before the advancing finger. The mention of this accident will insure against its occurrence. Another caution must be given, namely, that the first opening into the urethra should be sufficiently ample to insure its easy discovery upon search, so as to avoid the necessity of making several openings at different angles in a small urethra—an accident which might be followed by stricture. All care is necessary in extracting the stone. Hæmorrhage in young subjects is very devitalizing. All the blood that is possible should be saved.

Children cut by the lateral operation rally with surprising rapidity. Every surgeon of large experience recounts cases where, on visiting the child twenty-four hours after the operation, he finds him up and playing about the room—possibly out-of-doors with his companions. Accidents, however, do occasionally occur with the young, and due care should be exercised in the after-treatment to meet all symptoms appropriately—especially any indication of peritonitis, a complication of lithotomy proportionally much more common in childhood than in later life.

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[1] A patient, past middle life, from whom I removed, by the lateral operation, eight phosphatic stones weighing collectively two ounces three hundred and twenty grains, had been so tortured by pain during a number of years by his malady, which had been unrecognized, that he acquired the habit of opium-eating. His daily dose was seventy grains of opium and two or three ounces of laudanum. After the operation his pain ceased, and his opium was rapidly cut down to a very small daily dose. But, although he did well in every other respect, his wound absolutely refused to granulate during several weeks. On this account he was allowed to resume his large doses of opium, and, when he reached nearly his habitual quantity, his wound rapidly granulated and went on to speedy union; after which his opium was again reduced.—KEYES.

THE MEDIAN OPERATION.

The median is known classically as the Marian operation, devised in the sixteenth century, and afterward largely adopted and improved in Italy. Allarton has been its apostle in England, and the modern operation is known by his name. In this country Markoe first brought it into particular prominence, and the names of Little and Walter are also connected with it. Each of these three surgeons has enjoyed remarkable success with this operation.

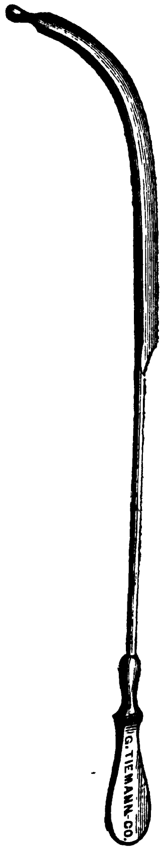

FIG. 118.

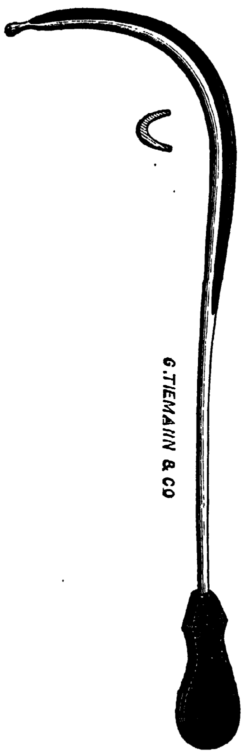

FIG. 119.

Instruments required.—The only instruments necessary, differing from those employed in the lateral operation, are three: a staff, director, and knife. The staff, of appropriate size, has a central groove, with a broad flare. Markoe (Fig. 118) and Little (Fig. 119) have each adopted a staff. The groove of the latter is deeper, furnishing, its author believes, greater convenience and certainty in dividing the membranous urethra. A ball-pointed probe, or a director, known as Little's (Fig. 120), is generally employed, and a straight, stout, sharp-pointed bistoury, generally made to cut slightly upon the back for a short distance from the point.

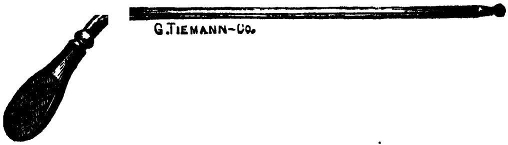

Fig. 120.

Operation.—The patient bound in the lithotomy position, and the staff introduced in contact with the stone, the operator passes the index-finger of the left hand into the rectum, familiarizes himself with the feel of the parts, and accurately locates the apex of the prostate, just where the staff enters it. He now transfixes the perinæum about half an inch above the anus, with the sharp-pointed bistoury, the cutting-edge upward, entering the point of the same, guided by his finger in the rectum, into the central groove of the staff, at the apex of the prostate.. The double-edged point is now advanced very slightly into the groove, so as certainly to enter the urethra, and barely nick the apex of the prostate. Finally, the knife is made to cut forward and divide the membranous urethra within, and, the handle being elevated in the vertical plane, the blade is swept around so as (theoretically at least) to avoid the bulb, and cut its way out along the raphe, the external incision being from one and a quarter to one and a half inch long. Thompson prefers making the incision from without centrally inward. The director is now passed along the staff into the bladder, and, these two being separated in an angular way, the neck of the bladder is dilated, some urine flowing out during the process. The staff is now withdrawn, and a finger introduced through the wound, with which the dilatation is completed, without cutting the prostate or the neck of the bladder. The stone—necessarily not very large—is withdrawn, as in lateral lithotomy, and the general after-care of the patient is the same.

The operation yields excellent results; the patient sometimes retains control over his urine from the first. The wound usually heals rapidly. The objections to the operation are: its general inapplicability except for stones which lithotrity is more capable.of managing, and the temptation to use violence during the extraction of a too large stone. It is emi-

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nently applicable for small stones, in a bladder which will not tolerate the use of instruments without chill or other disturbance, for multiple small stones in the adult, and for oldish boys, too young for lithotrity, who by reason of budding and advancing puberty are not very good subjects for the lateral operation. Where rather large stones are extracted by this method, incontinence, sometimes lasting several years, may occasionally ensue. The median operation has been variously modified, as by being combined with single or double prostatic incision, but mainly in relation to the means resorted to to dilate the prostate. Instead of the finger, Arnott's fluid-pressure has been advocated and employed. It acts too slowly to be useful. Teale has devised a branched metallic dilator, and Dolbeau[1] another, the latter to dilate twelve millimetres, which is the average limit fixed by Dolbeau, from experiments on the dead subject, to which dilatation can be carried without any laceration or injury. The dilator is applied first to the outer wound, and then gradually inward, until the passage is dilated to the required limit, not far from half an inch, after which, in Dolbeau's operation, which he calls "perineal lithotrity," the stone, if of greater diameter than two centimetres, is crushed with a forceps resembling the heavy-jawed forceps (Fig. 107), and the detritus carefully extracted. The objections to the operation are, that calculi which could be so dealt with safely can, for the most part, be more safely cured by lithotrity, while, if the stone is large, the lateral operation, with double section of the prostate, and crushing *in situ*, is undoubtedly preferable.

SUPRA-PUBIC OPERATION.

The high operation for stone, designed by Franco in 1561, has still a respectable advocacy. It is applicable only to large stone, where the choice must otherwise be a perineal operation, with the additional danger of crushing *in situ;* or, recto-vesical section, with its possible resulting fistula; and, finally, in cases of deformed pelvis. Humphrey,[2] who speaks with authority upon the subject, and is quoted by Thompson, states that the dangers in the high operation do not increase in so great a ratio with the size of the stone as they do in the lateral operation.

For the proper performance of the high operation for stone, two conditions are essential: the bladder must be distensible, the abdomen not too fat.

The Operation.—The pelvis is elevated several inches, so as to keep the abdominal viscera from gravitating toward the bladder. The cavity of the latter is injected. An incision is made in the median line, three or four inches upward, from the symphysis pubis. The linea alba is exposed, and divided below, for about a quarter of an inch. Into this opening the aponeurotome (Fig. 121) is passed, and the linea alba divided with it, for about two inches upward. Now, the "sonde à dard" (Fig. 122), with the dart concealed, is introduced. By depressing its handle, the point is carried up close behind the symphysis pubis, where the "dart" is pressed out, and made to appear in the lower angle of the wound. Upon a groove in the stylet which carries the dart, the anterior wall of the bladder is incised nearly down to the neck. The hooked gorget (Fig. 123) is now caught in the upper angle of the incision in the bladder, and firmly held up by an assistant, while the stone is extracted. If the latter is very large, the wound in the bladder may be widened by lateral incision.

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[1] "De la Lithotritie périnéale," etc., Paris, 1872.

[2] "Trans. Prov. Med. Ass., 1850," vol. xvii., p. 108

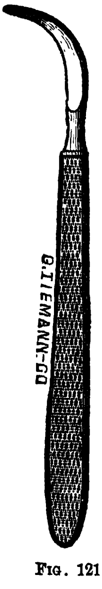

FIG. 121.

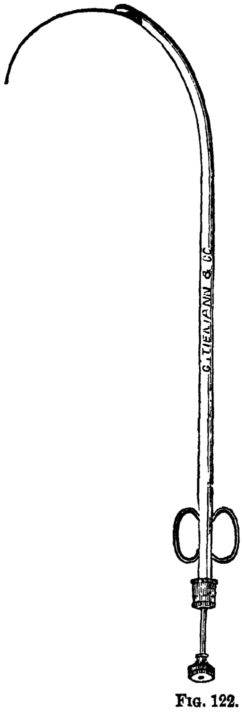

FIG. 122.

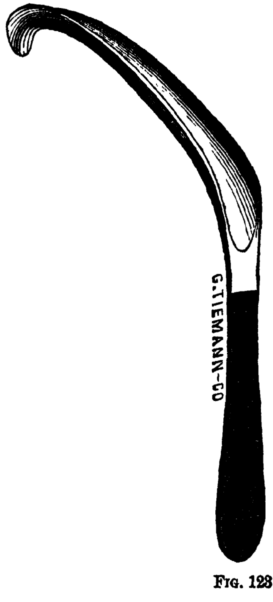

FIG. 123.

COMPLICATIONS OF LITHOTOMY.

Shock, exhaustion, septicæmia, pyæmia, erysipelas, possibly tetanus, may be encountered after lithotomy, and require to be met according to general surgical principles. Unusual complications in the way of hæmorrhage, besides those already alluded to, may occur in connection with the hæmorrhagic diathesis, or in those rare cases of irregular arterial distribution, where the main pudic trunk is defective, and its place supplied by an accessory pudic lying close along the border of the prostate, or where the artery of the bulb is given off farther back than usual, or the main artery of the prostate enters the gland in a position exposing it to injury. These complications are met by especial attention to the means of arresting hæmorrhage, already detailed in describing the lateral operation. Secondary hæmorrhage sometimes comes on several days after the operation. Thompson has had four cases, two of which were fatal. The wound is small; ligature can rarely be applied. Thompson advises perchloride of iron, carried in upon lint at the end of a probe, or the actual cautery. Perchloride of iron might be injected. South reports arrest of the hæmorrhage in several cases by pressure on the pudic artery, long continued.

Peritonitis, more common in the child, may complicate the operation in the adult. The rectum may be wounded, or the perineal wound may inflame from mechanical injury or diathetic cause, resulting possibly in sloughing of a part of the rectum. Fistula may be left behind, retention may follow the operation, or temporary or even permanent incontinence, and even occasionally sterility, from obliteration of the ejaculatory ducts by section or subsequent inflammation. Epididymitis may come on, as after any operation involving the prostate. Cystitis may run high from injury to the bladder during extraction of the stone; chronic disease in the kidney may be kindled into an acute state. All of these complications are to be met according to suggestions already laid down in other parts of this treatise.

By far the most common complications after operation are inflammation of the parts around the bladder-neck (cellulitis), and infiltration, both due to the same cause—mechanical violence in extracting too large a stone, or jagged fragments, through an insufficient opening. Lack of vitality in the patient undoubtedly conduces to these results, and infiltration may be due to an incision surpassing the limits of the fibrous capsule of the prostate. But that infiltration is more often dependent upon tearing and laceration during the extraction of large stones, is advanced by Thompson, supported by the fact that in children infiltration is rare, although the incision, as a rule, in the lateral operation, generally surpasses the limits of the prostate, and notwithstanding the fact that in children the cellular tissue is particularly loose.

Relapse of stone is liable to occur if any fragment is left in the bladder, and no part of the operation requires more care than the thorough evacuation of *débris*, in any case where a stone has been broken intentionally, or accidentally crushed during extraction. If, after healing of the wound, any symptoms referable to stone should continue, a careful search may detect the fragment, while yet small, and furnish an opportunity for the use of the lithotrite.

CASE OF INSTRUMENTS FOR STONE.

The following instruments might be grouped into one case. They are sufficient to meet all the ordinary requirements of stone:

Thompson's searcher.
Thompson's lithotrite, heavy and light.
Evacuating catheter.
Urethral forceps.
Lateral lithotomy-staff, small and large.
Median lithotomy-staff.
Lithotomy-scalpel.
Straight, sharp-pointed, narrow, stiff-backed bistoury.
Blizard's knife.
Blunt gorget.
Little's director.
Scoop.
Lithotomy-forceps, with crossed handles.
Lithotomy-forceps, with curved blades.
Crushing-forceps, with extra piece.
Tube with globular head, for washing bladder.
Shirted canula.
Keith's tenaculum.

CHAPTER XIX.

DISEASES OF THE URETERS.

Anatomy.—Anomalies.—Chronic Inflammation.—Dilatation.—Stricture.—Wounds.

THE ureters are the excreting ducts of the kidneys. They run down on either side behind the peritonæum from the kidney over the brim of the pelvis to the base of the bladder, and pass through its coats in an oblique, valvular way, making two of the angles of the trigonium Lieutaudii, of which the internal orifice of the urethra is the third. The structure of the ureters is mainly muscular. There is an inside mucous membrane, then come the circular and longitudinal layers of unstriped muscle, bound together by connective tissue.

Not very infrequently the ureter is double or triple; the abnormality existing through the whole length of the canal, or, more commonly, the several branches uniting above at a distance of one or more inches from the pelvis of the kidney, to form one canal from that point on into the bladder. Occasionally there is but one ureter. Sometimes the ureter ends in a blind extremity, in which case the kidney cannot functionate, and atrophies.

The diseases of the ureter are few and unimportant, being for the most part a continuation of other disease. Chronic inflammation of the ureter extending upward from the bladder, or downward from the kidney, exists, but is hardly worthy of consideration. Pressure (by tumor or otherwise) upon any portion of the ureter causes the canal above to become enormously distended, so that it may reach the size of the thumb or even larger. This occurs markedly in extrophy of the bladder, and is sure to happen if a kidney-stone becomes lodged in the canal on its way to the bladder. Stricture may follow the injury done by a calculus in its passage, or malignant or tubercular disease may extend to the ureter from the bladder or kidney. The blood in hæmaturia may come from the ureters. The ureter may be ruptured by external violence, or severed by a wound—injuries leading often to fatal extravasation of urine.

CHAPTER XX.

DISEASES OF THE KIDNEY.

Anatomy.—Anomalies.—Injuries.—Suppression of Urine.—Nephralgia.—Phosphatic Urine.—Oxaluria.—Gravel and Kidney-Stone.—Nephritic Colic.—Pyelitis, Pyelonephritis, and Peri-nephritic Abscess.—Pyelitis, Pathological Lesions.—Causes.—Calculous Pyelitis.—Peri-nephritic Abscess.—Treatment of Pyelitis (calculous), Solvent Treatment, Nephrotomy.—Hydronephrosis.—Kidney Cysts.—Hydatids.—Tubercle.—Cancer.—Ablation of Kidney.—Syphilis of the Kidney.

The scope of this work does not warrant a description of all organic and functional kidney-diseases.[1] Only such surgical diseases are here dealt with as are most frequently encountered by the practitioner interested in genito-urinary surgery, such morbid states as are liable to be attended with, or complicated by, functional or organic bladder-disease, or such as may require instrumental interference for their relief.

Anatomy.—The kidney lies on either side in the lumbar region, high up, its upper border reaching above the last two false ribs. It has the familiar shape of the kidney-bean, is surmounted above by the supra renal capsule, like a cocked-hat, and lies outside of the peritonæum surrounded by fat, with its hilum directed inward. The healthy adult kidney weighs from four to six ounces. It is surrounded by its own investing fibrous capsule, close inside of which lies the secreting or cortical portion of the kidney, dotted by its innumerable Malpighian bodies, and containing the convoluted uriniferous tubes; these terminating in the converging straight tubes which unite to form the pyramids, the medullary portion of the kidney. The pyramids terminate in nipple-like protuberances called papillæ, which dip into the cavity known as the pelvis of the kidney, each papilla surrounded by a cup-like cavity in the pelvis known as a calix. All of these calices unite to form the cavity of the pelvis of the kidney from which the ureter is given off. The two kidneys are sometimes united at their upper extremity, forming what is called the horseshoe-kidney, usually lying astraddle the spine. Sometimes there is but one kidney, in which case it is much larger than usual. Occasionally there are three or more. Instead of being fixed behind the peritonæum in the lumbar region, the kidney may be only loosely connected there, and may become displaced in the abdomen, and freely movable (floating kidney). Still more rarely the kidney is found in an abnormal position in the cavity of the bony pelvis, or elsewhere. If one kidney is absent, atrophied, or diseased, the other remaining healthy, the latter undergoes gradual conservative hypertrophy, greatly increasing in size.

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[1] For such information the student is referred to text-books on urinary diseases—Roberts, Rayer, Civiale, Dickenson, Moreland, and others.

CONTUSIONS AND WOUNDS.

The kidney is rarely wounded by any accident not in itself fatal. When the patient survives such an accident, more or less infiltration of the tissues by urine is sure to follow. The kidney itself inflames, causing partial or entire suppression, with blood in the urine, hot skin, high pulse, thirst, headache, pain running down to the testicle, vomiting, etc. Perhaps abscess results. Contusions are more common. The kidney may be ruptured or lacerated by a fall, by crushing violence, or by a severe blow. Such rupture may be caused where the signs of external violence are insignificant. If the anterior surface of the kidney be ruptured, the urine may escape into the peritonæum, giving rise to fatal peritonitis; if the posterior, the sub-serous tissues will be infiltrated, and chills, with high fever, will precede the formation of pus. The contusion may injure the vitality of a portion of the kidney, but not be attended by actual laceration. In such a case there would be more or less acute traumatic nephritis, terminating possibly in abscess.

The symptoms of laceration of the kidney vary in degree according to the extent of damage done. Collapse usually comes on at once with strong tendency to vomit, as in injuries of the testicle. There is pain over the injured organ, pain running down the ureter into the testicle, and in the testicle itself, retraction of the testicle; often pain across the hypogastrium, and a heavy, numb feeling in the thigh. The urine, which may require to be drawn at first through the catheter, will be usually bloody, scanty, and dense, possibly containing blood-casts of the uriniferous tubules, and frequently long, thin clots—casts of the ureter.

The prognosis, if the laceration be extensive, is almost necessarily fatal; if it be slight, the patient may survive.

Treatment consists in absolute rest, opium to quiet pain, and the use of the catheter and enemata to secure evacuation of the discharges.

Frequent and careful examinations must be made over the site of the injured kidney, and an exploratory incision as soon as the existence of pus is suspected. An early and free incision is of great importance, as pus tends to burrow downward and forward, giving rise to great constitutional irritation. If no pus be discovered, the infiltrated urine may be evacuated, and, in any case, an early, free, and deep incision can do no harm.

SUPPRESSION OF URINE.

In suppression no fluid comes down the ureters into the bladder. Suppression may be caused by fright or strong mental emotions, by injury to the kidneys, or the onset of an inflammatory attack, by the effect of cold or other cause; sometimes, especially if the kidney be the seat of previous chronic disease, by operations on the bladder or urethra, or even by the introduction of a sound or lithotrite (*see* URETHRAL FEVER), by the passage of kidney-stone, etc.

The symptoms are depression, languor, with apprehension, more or less fever, with hot, dry skin, and hard pulse. There may or may not be chill, vomiting, headache, and pain in back and loins, with constipation. No urine is voided, or only a little high-colored secretion. Instead of these active symptoms, suppression may come on gradually from advancing chronic kidney-disease, the amount of urine passed from day to day gradually diminishing. In the latter case there is usually anasarca, in the former not. Meanwhile the urea and products of tissue-metamorphosis are accumulating in the blood, and the patient becomes poisoned by them. Drowsiness and stupidity, perhaps delirium and coma, come on; there may be convulsions, and the patient dies in from two to five days, unless the flow of urine can be reëstablished. Before death the skin and breath have a urinous, cadaveric smell; there may be localized paralysis.

Diagnosis is easy. In retention the bladder is full, and can be felt above the pubes, the difficulty usually being to introduce a catheter. In suppression, the catheter glides in readily, but the bladder is found nearly or quite empty.

Treatment.—Dry cups and hot fomentations over the kidneys. Hot-air bath and hydragogue laxatives, to favor excretion of urea by the intestinal mucous membrane, the free use of warm drinks, flaxseed-tea, etc.; and, if there be no inflammatory condition, full doses of the acetate or citrate of potash and of infusion of digitalis, constitute the treatment. Turpentine should be avoided. Hyoscyamus may be given, and morphine subcutaneously.

In old cases of chronic bladder and kidney disease, suppression is an exceedingly dangerous symptom, and does not yield readily to treatment. It signifies extension of inflammation to the excretive structure of the kidneys, and is the normal termination of this class of diseases.

NEPHRALGIA.

Pain over the region of the kidney is a symptom by no means confined to diseases of that organ. It is found with many morbid bladder and prostatic conditions, and very often is simple lumbago, not dependent upon any internal malady. In bladder and prostatic diseases the pain in the back is more likely to occupy the sacral region, particularly the sacro-iliac synchondrosis on one or both sides. In lumbago the pain is usually much worse in damp weather, or on the approach of a storm; is aggravated usually by motion of the trunk, particularly in rising from a sitting posture. There is a popular impression that all kidney-diseases are attended by pain in the back, the severity of the disease regulating the amount of pain. This impression is incorrect. Some kidney-diseases are attended by pains in the back, others are not. There is, however, a variety of pain in the back, which has its seat in the kidney, and which is known as nephralgia. This pain is deep seated, felt in the back over the kidney, usually unilateral, often extending down around the side, following the course of the ureter, sometimes continuing on into the testicle, sometimes complicated by bladder-symptoms suggestive of stone in the bladder, or of chronic cystitis of the neck. The pain varies in intensity, and is usually made worse by fatigue. Pressure generally aggravates, sometimes relieves it. Often the patient cannot lie in bed upon the affected side. The pain is usually a dull, deep ache, occasionally sharp, darting, pricking, in character. It may come on gradually, or suddenly, and remains, according to its cause, from a short time up to many years, perhaps until death. Nephralgia is in reality a symptom, but may come on in a severe form independently of any organic disease.

Causes.—The main causes of nephralgia are very acid urine, kidney-stone, organic kidney-disease (pyelitis, cancer, any morbid deposit or tumor), and many other morbid conditions, special diseases, abdominal aneurism, etc. It may owe its origin to, and be kept up by, perversion of the sexual function, or ungratified sexual desire. Over-acid urine is in itself a sufficient and a not infrequent cause. The urine in health is slightly acid, especially after fasting. As a rule, however, in the healthy state there is an alkaline tide (as Roberts has denominated it) to the urine, which comes on after each meal, and lasts several hours. The heavier the meal the later but the more lasting the tide. In the morning, with American habits of living, it occurs at about 10.30 o'clock.

The urine, then, shortly after breakfast, should be normally neutral, or even faintly alkaline, and, when it is not so, a diagnosis of over-acid urine may be safely made.[1] The causes of over-acidity of the urine are the rheumatic diathesis, old age, the use of wines and liquors, but especially of fermented malt liquors, ale, beer, etc., and of sweet, sparkling wines (champagne). The latter of the above-mentioned causes act directly as irritants to the urinary tracts by producing large quantities of sharp-pointed crystals of uric acid which mechanically scrape and irritate all portions of the mucous membrane. The urine may be over-acid while its true character is masked by some bladder or kidney inflammation which furnishes enough (volatile) alkali to neutralize the whole flow. This source of error has to be constantly guarded against. There are no inflammatory conditions, acute or chronic, of any portion of the urinary passages which are not distinctly aggravated by over-acid urine, while some of them are caused in the first instance by it. Hence it becomes a part of the hygiene of the urinary passages (p. 40) to see that the alkaline tide exists, say at eleven o'clock in the morning, and, if it does not, to cause it to do so by attention to hygienic laws and the internal administration of a suitable alkali. In all cases of nephralgia where careful examination fails to detect any tumor of the kidney, or any disease of the bladder or prostate, suspicion should fall at once upon an over-acid state of the urine as being the cause, or possibly retained kidney-stone with pyelitis, or pyelitis from some other cause (cheesy tubercle, etc.).

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[1] If the patient has neglected to pass water before breakfast, the very acid urine collected during the night may not be neutralized by the alkaline tide. Simple mention of this fact will preclude error; nor is it necessary to test only the urine voided during the

Diagnosis.—To decide between these affections, a careful examination of the urine is necessary after excluding bladder and prostatic disease. In pyelitis there will be constantly more or less pus in the urine. In nephralgia due to over-acid urine the alkaline tide is usually absent; crystals of oxalate of lime and of uric acid may be found in the urine when passed, while the color is usually deep, and the specific gravity constantly high. There may be also in the urine more or less pus proportionate to the amount of irritation produced by the acid urine and the duration of the complaint. Such urine when left to stand in a glass may become almost solid on cooling, by the precipitation of pink amorphous urates, or, if the latter ingredient be not sufficiently abundant to produce this result, a blue line, like the bloom on a plum, will form around the top of the glass just at the edge of the urine. Finally, after a few hours such urine may begin spontaneously to deposit large red crystals of uric acid upon the sides and bottom of the glass.

Prognosis.—The deep-seated, dull, boring pain over one or both kidneys may last for years, kept up by over-acid urine, in patients of sedentary habits whose nervous tone is depressed by overwork, alcohol, or tobacco. Nephralgia very often coexists with irregular use of the sexual organs, or ungratified desire.

The *treatment* is slowly but surely effective unless there exists organic mischief. It consists in a properly-regulated hygiene, much out-

few hours after breakfast, for this is alkaline often where habitual over-acidity exists none the less. The practical test is this: urine should be voided on rising in the morning, and not again till 10.30, at which hour it should be neutral.

door exercise, Turkish, Russian or other baths, dry frictions of the skin daily with hair gloves, rather light diet, the avoidance of overwork and of the abuse of alcoholic beverages (particularly fermented liquors) and of tobacco. In persistent cases of pure nephralgia in young adult males the hygiene of the sexual organs is almost invariably at fault, and requires attention. An acquaintance with this fact is the key to successful treatment in many cases. The means detailed above, aided by half-drachm doses of citrate of potash three times daily, or the plentiful use of Vichy or other alkaline water, will usually sooner or later get the better of the complaint. If a laxative is needed, about ℥ vij of Friedrichshalle water, to which a little hot water is added, may be taken with benefit one hour before breakfast every morning.

PHOSPHATIC URINE.

In connection with the above, the converse state, over-alkaline urine, should be referred to. Here the urine is habitually neutral or alkaline, while the alkaline tide is unduly marked. The fluid is pale, of light specific gravity, and often, after standing a few hours in a glass vessel at ordinary temperatures, it commences to decompose. Such urine, when passed, often has a faint mutton-broth or chicken-soup odor, and the last drachm or more of the flow is very apt to be as white as milk, from an excess of precipitated amorphous phosphates. This white flow is not constant. It may come only with the alkaline tide after breakfast. It is a cause of unceasing anxiety to many patients, who believe it to be seminal fluid. The urine when set aside shows the glossy, iridescent, phosphatic pellicle very quickly, instead of the faint bluish line at the top of the fluid on the glass, which is produced by urine rich in urates. Phosphatic urine is apt to contain crystals of oxalate of lime when passed, and to show at once or shortly afterward innumerable vibriones, the rapid development of which is undoubtedly due to the presence of phosphate of lime. Phosphatic urine alternates from time to time with over-acid urine, so that the same patient may have for a few days a dirty-brown sediment of urates in his chamber, which he sometimes mistakes for blood, and then for a few succeeding days a dense white deposit which, if his sexual relations be not perfectly natural, he is pretty sure to consider seminal fluid. The alternations sometimes seem to depend upon the greater or less amount of mental worry and physical exercise, the quantity and quality of the food, and the condition of the digestion. Sometimes both deposits exist in excess at the same time, so that the discharge may be creamy as it comes from the bladder, and deposit an enormous amount of urates and phosphates, recalling the solid urine of snakes and birds.

The symptoms found with phosphatic urine are usually those of lassitude, listlessness, a feeling of general weakness often attended by despondency. There are usually, also, dull, continuous pain in the back of the head, and unsatisfactory digestion.

Phosphatic urine depends usually upon nervous exhaustion, and is often associated with weak digestion, a diet formed mainly of the cereals and starchy food, with a dislike for meat. Excessive use of tobacco aggravates any existing tendency to the production of phosphatic urine; masturbation, or excessive venery, often leads to it by exhausting the nervous force; mental anxiety and worry produce it temporarily. Thus, students who study all night, before some critical examination, are certain to have an excess of phosphates in their urine on the following day. In the same way, any continued mental tension, anxiety, or fatigue, may produce it. As may be inferred from its etiology, this affection is mostly confined to youth and early adult age.

The treatment consists in removing the cause, if possible, reëstablishing mental quietude, cutting off tobacco, tea, and coffee, encouraging pleasant out-door relaxation, with travel, change of scene, and air.

As medicine, phosphoric acid (Horsford's acid phosphates) with or without a little strychnine, iron, or quinine, and perhaps some bitter vegetable infusion, or tincture, are usually employed, and would seem to be indicated as appropriate tonics. The cause of phosphatic urine is evidently associated with morbid action of the ganglionic nervous centres, affecting the secondary assimilation of food, and those remedies which are most effectual in correcting this curious and unpleasant condition are measures which place the patient under the influence of more favorable conditions of life temporarily. Hence, a trip to the mountains, camping out, sea-voyage, etc., are more potent in securing relief than any drug.

OXALURIA.

The octahedral crystals of oxalate of lime, together with (less frequently) the dumb-bell crystals, the little spherules and the amorphous dust of the same, are not infrequently found in the urine, either alone or coexisting with crystals of uric acid, and with deposits of amorphous phosphates or urates. Such urine is often acid, dense, and high-colored. Sometimes the crystals appear accidentally in the urine from the free use of rhubarb, or indeed of tomatoes. Usually, but not necessarily, the crystals appear in cases of disturbed or exhausted nerve-power, and imperfect digestion. They are found also with some diseases of the brain and spinal cord. Nervous prostration, produced by excessive venery, is quite likely to be associated with them. In short, nervous, irritable, hypochondriacal individuals, especially of the gouty temperament, particularly if young, with perverted, over-stimulated, or ungratified sexual desires; if overfed, under-exercised, and leading a sedentary life—such patients frequently have oxalate of lime in their urine, and suffer from an interminable series of unusual complaints, with which they are pretty sure to torment their physician as well as themselves. The oxalate of lime is not a cause of the disorder, but rather a symptom. These cases are met by hygiene, change, and a proper regulation of all that has gone astray. If enough of any alkali be given to render the urine abundant and limpid, the oxalate of lime will usually disappear for a time; and this course is advisable, as well as the frequent use of baths, to free the blood as much as possible from any effete materials which may have been collecting there. The true curative treatment, however, is purely hygienic, and based upon a correct appreciation of the causes. As a rule, the less medicine taken the better. The mineral acids and strychnine seem sometimes to do good as tonics.

GRAVEL AND KIDNEY-STONE.

The solid substances naturally held in solution, and excreted with the urine, are sometimes precipitated in the crystalline form in the kidney-tubules, or at other portions of the urinary passages, and voided as crystals, always visible with the microscope, sometimes to the unaided eye. This is gravel. The cause of its precipitation lies in the fact that the urine becomes too concentrated—too heavy with organic constituents. As most frequently met with in practice, gravel is composed of uric acid, and forms the red sand which quickly collects around the sides and bottom of the vessel containing the urine. The gouty constitution predisposes to the formation of this red sand, especially when aided by a sedentary life and high living, more nutriment being ingested than can be disposed of, especially meats and alcoholic beverages, among which new fermented liquors and sweet, effervescing wines hold the first rank. Gravel is more frequently seen in summer than at other seasons, on account of the greater activity of the skin, which leaves less fluid to be excreted by the kidneys, and consequently leads directly to a concentration of the urine. The tendency to the formation of gravel is often hereditary.

The symptoms occasioned by gravel are those set down for *nephralgia*, and, added to them, often symptoms of a low grade of cystitis or urethritis—the smarting, burning sensations on urination being especially prominent. All bladder or urethral inflammations are greatly aggravated by the existence of "red sand" (sharp crystals or concretions of uric acid) in the urine.

Treatment.—After what has been so frequently repeated in previous sections, of the ill effects of highly-acid urine, it is needless to delay long with the consideration of gravel. An abundance of alkaline diluents for a few days will always cause the red sand to disappear, and the symptoms occasioned by it will shortly afterward cease to be troublesome in pure cases of gravel. The true treatment is preventive; that is, so regulating the food, drink, exercise, and hygiene of living, that the offensive ingredient may cease to appear. To effect this, the constant use of some mild, pleasant, alkaline fluid (such as Vichy water) is often desirable. It is well to take a draught of this, or some other fluid, before retiring, and between meals, for the purpose of diluting the urine of fasting.

From gravel to kidney-stone is but a single step. It is only necessary for some of the crystals to be detained for a time in the kidney and there form a nucleus, and we have at once kidney-stone. Such detentions of crystalline material in the kidney do occur. Attentive examination of sections of kidneys after death will sometimes reveal numerous yellowish or brown striæ running from the papillæ toward the base of the pyramids. These depend upon the precipitation of amorphous urates in the straight kidney-tubules, and are usually caused by the *post-mortem* cooling of the body, which diminishes the solubility of this ingredient and occasions its deposit. In still-born infants, and in children dying within forty-eight hours after birth, these striæ are not infrequently found composed of uric acid. A similar precipitation of urates, uric acid, or oxalate of lime, may occur during life. If it be washed out by the urine accumulating above, we have some sand or amorphous dust in the voided fluid. But such concretions may become impacted and permanently lodged in the urinary tubules. Here they may cease to grow, or may increase in size in the kidney-substance, leading, perhaps, to the formation of cysts, by occlusion. Finally, these concretions, when washed down by the urine, may fail to escape from the pelvis of the kidney and become lodged in one of the calices or in the pelvis itself. A nucleus once existing in this situation becomes a foreign body, and goes on increasing in size by the deposition of new crystals or amorphous matter furnished by the urine.

The precipitation may occur primarily in the infundibula or pelvis of the kidney. The number, size, and shape of these kidney-concretions vary infinitely. Several hundreds of them have been found in a single kidney after death. They vary in size from a pin's-head to a nut, and may reach the weight of several drachms in old cases. They are usually smooth, oval in shape, or with facets from mutual friction, if several of them lie together; or they may assume every variety of prolongation and arborization. They may be rough on the surface, especially if composed of oxalate of lime, or, if they excite pyelitis, their surfaces may become incrusted with triple and amorphous phosphates. Blood-clot, portions of hydatid cysts, or little masses of concrete pus, may serve as the nucleus for renal calculus.

The symptoms of kidney-stone are variable. As long as they are small and do not excite inflammation, or become engaged in the orifice of the ureter, the patient may not be informed of their presence by a single unnatural sensation, so that an autopsy may first reveal an unsuspected kidney-stone. Occasionally they attain large size, and even destroy extensive portions of the kidney by pressure, without occasioning any symptom to attract the patient's attention. Again, symptoms of kidney-stone, with paroxysms of pain, may exist for a time, and then cease, either because the stone has occluded the ureter and led to atrophy of the kidney, or because it has become encysted and has ceased to irritate the mucous membrane, or to oppose the escape of urine. Sooner or later, however, kidney-stones usually manifest their presence in one of three ways, either by setting up inflammation of the pelvis of the kidney (calculous pyelitis), by their passage into the bladder (nephritic colic), or by remittent or persistent nephralgia.

The aching pain in the small of the back, with all its accompanying symptoms, as detailed under the head of nephralgia, may depend on kidney-stone. This pain is usually made worse by pressure, but there is no distinctive character to it which enables the surgeon to decide positively whether the pain depends upon retained stone or other cause. When, however, the cause lies in kidney-stone, while the crystals in the urine remain the same, it may sometimes be noticed that the blood-disks, oval, round, and spindle-shaped epithelial cells and scattered pus-cells, which the urine is pretty sure to contain, become increased in quantity after exercise, while they sensibly diminish, or perhaps entirely disappear, after rest in bed for a few days.

The treatment of stone retained in the kidney will be considered under the head of Calculous Pyelitis (solvent treatment).

NEPHRITIC COLIC.

When a kidney-stone engages in the orifice of a ureter and attempts to pass into the bladder, it gives rise, usually, to well-marked symptoms. Kidney-pains may sometimes be occasioned by the dislodgment of a calculus from an infundibulum into the pelvis of the kidney, or from one portion of the pelvis into another. They become most severe, however, when the ureter is entered. The pain is marked by its paroxysmal character. It commences suddenly, perhaps seizing the patient while at a meal, or at any time when seemingly in the best of health, perhaps most frequently shortly after rising in the morning. It shoots down the ureter into the scrotum and to the end of the penis. The testicle of the affected side is often strongly retracted. Sometimes in a severe paroxysm the whole scrotum and penis are drawn up into a hard knot, as it were, giving the patient the idea of squeezing, dragging, twisting, of these organs. The pain may also extend down the thigh on the affected side. There is usually an incessant desire to pass water, with sometimes almost entire suppression. What little urine is voided comes away high-colored, and in small quantities at a time, often tinged with blood and mixed with epithelium from the kidney. Pain attends urination, chiefly toward its close, running down to the end of the penis. During the paroxysms, especially if severe, faintness, nausea, and vomiting, come on; the skin is covered with a cold sweat; the patient tosses restlessly about, seeking relief, but finding none.[1] In the intervals of the paroxysms there is a sense of soreness and discomfort, perhaps amounting to continued pain, or the relief may be more positive, if the concretion be small. Usually, after a number of paroxysms, lasting from a few hours to many days, suddenly all pain ceases at once. The calculus has dropped into the bladder, and the suffering is over. Instead of this happy termination, the stone, after having engaged in the upper end of the ureter, may drop back into the pelvis of the kidney. Relief of the severe pain follows, but the patient's condition is an unenviable one, for perhaps the stone is too large to pass. Again, the paroxysms of pain may extend over a long series of days or weeks, coming on, perhaps, at a certain hour every day, or at longer intervals. In one (personal) case, the paroxysms came every Sunday, in the afternoon, for several weeks. This periodicity may be so marked as to give rise to the idea of some malarial element in the case. It is needless to add that quinine does not control the paroxysms. In this way the symptoms may linger along indefinitely, tiring out both patient and surgeon.

A termination always to be feared is, impaction of the calculus in the ureter. In such cases, the patient will indicate some spot along the course of the ureter where he feels constant pain, increased by local pressure. The pain will be less severe than during the paroxysms, but it will be constant. A stone is most apt to halt near the outlet of the ureter into the bladder. If the ureter is blocked up almost entirely, the function of the kidney on that side will be interfered with. The ureter above the obstruction, and the pelvis of the kidney, will fill up with urine, subjecting the secreting structure of the kidney to pressure, and perhaps occasioning drowsiness, headache, with symptoms of mild uræmia. If the other kidney be diseased, or its ureter obstructed, these symptoms will be by so much the more certain to ensue. If the other kidney and ureter be sound, enough urine may trickle past the stone to prevent these symptoms from being marked. In such cases the ureter above the stone gradually dilates, as does also the pelvis of the kidney, pressing upon and causing the gradual atrophy of the kidney-substance, so that after death the ureter may be found as large as the small intestine, containing perhaps several stones, while the kidney is replaced by a fibrous sac, more or less distended with purulent fluid, inflamed or ulcerated; or perhaps by a mass of semi-solid pus (pyo-nephrosis), or hydro-nephrosis may come on. The effect upon the ureter at the point of impaction of the stone is to cause ulceration, with perhaps the growths of granulations which bleed easily, and may give rise to hæmaturia. Sometimes, after being lodged for a while, a stone will finally pass, but the ulceration of the ureter left behind by it may go on to the formation of stricture and the production of the same results as if the stone had remained.

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[1] If the paroxysms be severe and long continued, more or less fever, with great thirst, hot skin, and quick pulse, results.

After a stone has finally entered the bladder, the symptoms cease. The constant desire to urinate is rarely aggravated by the presence of the small foreign body, although sometimes irritability is increased. Any thing which will pass the ureter will also pass the urethra, if the latter be not strictured. Such, indeed, is usually the case, and, after the cessation of the pains in an attack of kidney-colic, the urine should be carefully watched; for the little calculus, which caused so much distress in getting into the bladder, may reach the outer world without giving any evidence of its passage. It is always a satisfaction to find the stone, both to confirm the diagnosis, and to insure against the fear of subsequent stone in the bladder. Sometimes the stone is large enough to cause considerable pain in passing the urethra, or indeed it may become lodged there. Lastly and not uncommonly, the stone once in the bladder and the patient relieved, he recovers from his irritability, and forgets his pains, thinking himself well. In this dangerous state of unconcern he lives perhaps for years, the stone constantly growing by new accretions, but not occasioning much distress, until finally, from some new exciting cause (cold, exercise), or in the natural course of events, he suddenly breaks down with a sharp attack of acute cystitis, and upon search a stone of some size is found in the bladder.

Diagnosis.—Kidney-colic is not liable to be mistaken. In severe nephralgia from highly-acid urine or gravel, there may be similar paroxysms of pain, but the testicle is not so apt to be retracted, nor the paroxysm to be so severe. The passage of blood-clots or of hydatids through the ureter, as well as kidney-stone, occasions true colic. An inspection of what is passed by the urethra can alone clear up such cases, which are exceedingly rare. The patient's previous history or antecedents often furnish valuable presumptive evidence. An individual having once passed a stone, is always liable to have another one form, unless he regulates his life so as to avoid the causes of acid concentrated urine.

Treatment. — During the paroxysms, prolonged immersion of the whole body in very hot water, or the local use of dry cups and hot fomentations, may produce relaxation. If the pain become unbearable, ether by inhalation should be given, sufficient to moderate it. Kneading the course of the ureter is occasionally of service. A sudden change of position may sometimes dislodge a stone after it has become engaged in the orifice of a ureter; but, once engaged, it is better that it should pass. Opium or belladonna may be used by the rectum when the pains are protracted, and the attack promises to be a long one. It is of the first importance to promote a free secretion of urine, so as to act upon the stone from behind, by an abundance of liquid pressure. This is effected by warm drinks, half-drachm doses of acetate or citrate of potash every few hours, or half-ounce doses of infusion of digitalis, until free diuresis is produced. These means should be persisted in intelligently, if the stone become impacted in the ureter. If the stone fail to reach the bladder, being retained in the kidney or impacted in the urethra, the solvent treatment for stone is applicable (*see* CALCULOUS PYELITIS). If the stone reach the bladder, but fail to escape through the urethra, diluents should be continued and the urine retained until the bladder is full, so that each act of urination may be accomplished in a full stream. If it still fail to pass, the lithotrite is the natural remedy. On no account should a nucleus for future vesical calculus be left behind.

After one attack of nephritic colic, the patient must be instructed in the proper course of life to follow in order to avoid the formation of another stone. The diet should be low and largely vegetable, and the use of all acoholic stimulants interdicted, especially the use of new fermented liquors. Plentiful out-door exercise should be taken, and the reaction of the urine be watched. Vichy water or some mild alkaline diuretic should be adopted as an habitual beverage to keep the urine abundant and diluted. The patient should also acquire a habit (Roberts) of taking a full draught of water between meals, and on retiring, so as to dilute the urine of fasting, which is normally concentrated and over-acid. The alkaline tide after taking food insures against the formation of stone during those periods.

PYELITIS, PYO-NEPHROSIS, AND PERI-NEPHRITIC ABSCESS.

PYELITIS is an inflammation of the pelvis and calices of the kidney. Like most other inflammations of the urinary passages, it is usually encountered in practice in the chronic form, undergoing perhaps from time to time acute exacerbations. The pathological appearances in the acute form are, a uniform redness of the mucous membrane, frequently dotted in a punctate manner with little ecchymotic spots, or perhaps with free blood on the surface of the membrane. There may be false membranes attached or blocking up a ureter, otherwise the fluid contained in the kidney is a mixture of urine, pus, blood, with more or less epithelium. In chronic pyelitis the membrane is thickened, tough, pale, bluish-gray, crossed by branching vessels. There may be spots of ulceration. Rayer[1] describes vesicles of the size of a pin's-head studding the mucous membrane in many chronic cases. Rarely the ulcers are covered by deposits of triple phosphates. Sometimes the surface of the membrane is distinctly granular. There are found, perhaps, within the pelvis of the kidney, cancerous or cheesy tubercular deposits, hydatids or other entozoa, kidney-stones incrusted or not with phosphates, etc.

Where there has been obstruction of the ureter, the condition known as *pyo-nephrosis* is liable to be encountered after death, namely atrophy, more or less complete, of the secreting or tubular portions of the kidney with dilatation of the pelvis and calices, the kidney being, perhaps, replaced by a large pouched sac filled with semi-solid pus or pus and blood, with precipitated phosphates and urates. The septa between the pouches may be calcified or imperfectly ossified. Sometimes the pus is absolutely solid, and seems to be stratified, so that it can be removed in layers; often it is cheesy, with soft spots. Sometimes the pus collected in the kidney pelvis has ulcerated its way out, giving rise to peri-nephritic abscess. It may point externally, leaving behind a fistulous tract which usually remains permanent. Occasionally after pyelitis, the kidney atrophies instead of becoming pyo-nephrotic. Pyelitis is more often double than single. If it depend upon a cause acting on one side only (impacted stone), the other kidney may be healthy, although enlarged by conservative hypertrophy.

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[1] *Op. cit.*, vol. iii., p. 4.

Pyelitis is usually entertained by some cause and the problem for treatment is not so much to remove the inflammation from the pelvis of the kidney, as it is to remove the cause which keeps it up.

Causes.—Pyelitis is not an idiopathic disease. Of all the numerous causes which may occasion it, two are in constant action in the community, and furnish the bulk of the cases. These are—

1. Chronic prolonged obstruction to the free escape of urine from the bladder, and chronic inflammation of the latter organ.

2. The retention of kidney-stone, or, more rarely, its impaction in a ureter.

The first of these causes is constantly at work in stricture and prostatic hypertrophy. Here the bladder becomes inflamed, the damming back of the urine is felt by the kidneys, and their mucous membranes are kept constantly more or less congested, until finally, from some provocation, such as cold or retention, or the use of instruments in the bladder, an acuter phase of inflammation is set up in the latter organ, which is very prone to travel rapidly up the ureters and locate itself permanently in a chronic form upon the pelves of the kidneys. Here it remains in a subacute state, suffering occasional exacerbations of acuteness, and liable to become complicated by inflammation of the secreting structure of the kidney, attended by uræmic symptoms and speedy death. Pyelitis under these circumstances is mild in character, does not occasion any severe symptoms, and goes, for the most part, unnoticed by patient and surgeon. Its presence may always be inferred in old cases of obstructive prostatic and urethral disease, and it must be remembered that in these diseases danger to life is more to be apprehended from this than from any other quarter.

By far the most frequent cause of such pyelitis as manifests itself during life by positive symptoms referable to the kidney, is stone retained in the kidney. By the same mechanism as in the bladder will stone in the kidney sooner or later give rise to inflammation of the mucous membrane upon which it rests. Stone impacted in a ureter inevitably leads to the same result by distention of the pelvis of the kidney with retained urine, and by the secondary decomposition of the fluid, the mechanism being similar to that causing cystitis with atony, from prolonged retention of urine. Hence any thing which will cause prolonged distention of the pelvis of the kidney, retention of urine, blood, entozoa, false membrane, etc., blocking up a ureter, is able to occasion pyelitis. Pressure of the pregnant uterus in the female probably acts in the same way, in inducing that fatal form of pyelitis attending lying-in women, even where there is no pyæmia.

Besides the above causes, a host of others may be enumerated as more rare. Thus, the irritating action upon the kidneys of turpentine, of constantly over-concentrated, over-acid urine; the existence of chronic forms of Bright's disease; the deposit of cancerous or tubercular matter in the walls of the kidney pelvis; foreign bodies other than stone; worms, hydatids, clots, etc. Pyelitis also attends certain diseases as a complication at times, the eruptive fevers, typhus, cholera, etc., and is found not infrequently with pyæmia and carbuncle.

Symptoms.—Pyelitis is usually attended by pain in the back, of the same character as that described in the section on *nephralgia.* This pain is made worse by pressure, and is usually confined to the affected side, although there may be pain over both kidneys when only one is diseased. When the affection depends on kidney-stone, usually there have been some attacks of nephritic colic more or less marked. Occasionally, however, the disease comes on in an insidious manner, with little or no pain in the back, what symptoms there are being referred to the bladder Sometimes paroxysms of pain, resembling nephritic colic, are experienced where there is and has been no stone. Early in the disease the urine will usually be found to contain blood-disks, a little excess of mucus, with many small, round, oval, spindle-shaped, and irregular epithelial cells, such as abound in the pelvis of the kidney. There is a trace of albumen depending on the blood, and the urine reacts acid. As the disease advances the epithelial scales are replaced by pus-cells, not in clusters, but evenly distributed through the urine, giving it a uniform, turbid appearance when voided. The amount of pus steadily increases in quantity, the urine usually remaining strongly acid; on standing, this pus settles down into a dense, greenish, oily-looking deposit. Violent exercise increases the nephralgia and the amount of pus in the urine. Often the pus diminishes greatly in quantity for some days, and suddenly reappears in excess. This phenomenon is especially noticeable when the kidney has become sacculated. The pus retained in a sacculus accumulates there, until finally it bursts its barriers and reappears in quantity for a day or two, when it will again cease to flow abundantly, until the sacculus has had time to refill. The pain in the flank is often greater when the pus is not flowing, and any swelling existing there is apt to become more prominent. These variations in the amount of pus are less marked when both kidneys are affected. In rare cases there may be no discharge of pus whatever, as when the ureter is absolutely occluded.

Chills of varying duration and intensity are often present, especially if the kidney is sacculated and contains large amounts of pus. These rigors may assume the quotidian or tertian type, and recur with great regularity, especially in the evening.

One symptom of pyelitis is very liable to lead to error of diagnosis, especially if the pain in the back has not been prominent and no tumor exists in the flank. This symptom is frequent micturition. The irritating properties of the pus in the urine stimulate the bladder to repeated contractions, and many a case of pyelitis has been treated as chronic cystitis, powerful injections being thrown into the bladder in the vain hope of controlling the formation of pus, which is supposed to have its origin there. The bowels usually act irregularly, diarrhœa and constipation alternating with each other, due to inflammatory adhesions between the dilated kidney and the colon, or to the mere mechanical pressure of a distended pyo-nephrotic kidney upon the large intestine passing over it. When the kidney becomes dilated and sacculated by the pressure of accumulated pus, a tumor is formed, which is tender on pressure, sometimes affording a feel of deep fluctuation, more or less perceptible to sight and touch, according to its size, sometimes becoming appreciably smaller after a free discharge of pus in the urine. The position usually occupied by such a tumor is in the flank between the last ribs and crest of the ilium. On the right side the transverse colon may separate the tumor from the liver, but this diagnostic sign may be absent, from inflammatory adhesions having taken place between the coverings of the two glands. The tumor formed by a pyo-nephrotic kidney is occasionally large enough to extend across the middle line of the abdomen.

As the disease advances the patient becomes cachectic, pale, and debilitated. Hectic fever may set in and close the scene, the patient being worn out by constant suppuration, or poisoned by the urea, which cannot find an exit through his altered kidneys. Ulceration of the pelvis of the kidney may occur, especially if it contain stone, and, through an opening thus made, pus and urine may infiltrate the tissues, forming peri-nephritic abscess. This points in the back or under Poupart's ligament (simulating psoas abscess), or opens into the bladder or pleural cavity, into the lung, or, more commonly, into the intestine—rarely into the peritoneal cavity. A distended, sacculated, pyo-nephrotic kidney in the same way may contract inflammatory adhesions to all the surrounding tissues, and finally break and burrow in any of the above directions. The tumor subsides rapidly when the pent-up matter has found an outlet, but, unless the calculus or other offending body escapes, or is extracted through the opening, a permanent fistula is pretty sure to remain. When such an abscess breaks into the bladder, bowel, or lungs, the subsidence of the tumor is attended by a copious discharge of pus at the anus, urethra, or mouth. After the abscess has discharged itself and remained fistulous for a time, in some favorable cases, it may gradually shrivel and dry up, owing to total atrophy of the kidney, and in such cases, if the other kidney be healthy, the patient recovers completely.

Peri-nephritic abscess does not necessarily depend for its origin upon antecedent kidney-disease. It may come on as the result of fatigue, and a straining exertion of the muscles about the kidney-region, from cold or other cause. Three exceedingly interesting examples of peri-nephritic abscess, not caused by or attended with any kidney-disease, are reported by Dr. H. J. Bowditch, in a paper read before the Boston Society for Medical Observations, May 4, 1868. In each of these there was a distinct tumor in the right loin, with the usual train of symptoms, chills, hectic, etc.; in each there was pulmonary and pleuritic complication, with discharge of pus by the mouth, the matter having made its way up along the sheath of the psoas muscle into the pleural cavity; and in each there was marked relief of all symptoms, and ultimate recovery after a timely opening into the tumor, which was made in two of the cases before fluctuation could be distinctly felt. In two of the cases the kidney was recognized by the exploring finger free in the cavity of the abscess, but neither microscopic nor chemical test applied to the urine revealed the presence of kidney-disease. These cases demonstrate the advantage of early opening for peri-nephritic abscess.

Instead of breaking externally, a pyo-nephrotic kidney, after its secreting substance has become atrophied, may consolidate into a hard, cheesy mass, and cease to give trouble. One perfectly good kidney is sufficient for life. Unfortunately, the disease is most often double.

Prognosis.—The prognosis of pyelitis depends upon its cause. The milder cases, occurring with stricture or prostatic disease, cease to be troublesome after successful treatment of the latter. The forms occurring with fevers, pleurisy, and zymotic diseases, often get well quickly, if the primary disease spares the patient. In pyæmia and carbuncle, the complication aggravates the prognosis. Depending upon local cancer or tubercle, the affection does not get well. With hydatids or calculus it is severe, but not necessarily fatal. Double pyelitis is generally fatal. Where there is pyo-nephrosis the chances of recovery are not great, but with one sound kidney there is always hope. Autopsies have revealed wasted, withered sacs, perhaps clasping a stone, or a mass of hard, concrete pus, whose existence had never been suspected during life. Discharge of the pus by other than the natural channel is often speedily fatal, except in favorable cases where the opening occurs through the loins.

Treatment.—When pyelitis depends upon bladder, prostatic, or urethral disease, its treatment is identical with that of its cause. The same is true of cancer, tubercle, etc. In fever, zymotic, or scorbutic disease, the main malady must be treated, care being exercised to prevent the urine from becoming too acid, and concentrated. Where it is attended with considerable hæmorrhage, tannin, gallic acid, acetate of lead, opium, ergot, or other styptics, may be advantageously tried.

During an acute attack of pyelitis, with great pain, high fever, frequent urination of bloody purulent matter, wet cups over the kidney, hot baths, hot local fomentations, warm diluent drinks, and opium to allay pain and spasms, are the main features of treatment. In chronic cases, however, such as are not infrequently met with in practice, where there is reason to suspect kidney-stone, and where constant suppuration is wearing out the patient, the surgeon's duty lies in putting him into the best possible hygienic conditions, giving him the advantage of rest, country air, and a sustaining diet, with such tonics as iron, quinine, and cod-liver oil. Roberts speaks highly of large doses of muriated tincture of iron. Alkaline diluents will sometimes diminish the amount of pus, by making the urine less concentrated. Wine is often serviceable, and in some cases the mineral acids improve the digestion, increase the strength, and better the condition of the urine. The vegetable astringents, alum, and the terebinthinates, are occasionally useful as stimulants to the mucous membrane in chronic cases.

If there is reason to suspect kidney-stone, *the solvent treatment* should be persistently employed—unless, of course, there is pyo-nephrosis with a palpable tumor, and reason to believe that the secreting portion of the kidney is atrophied to such an extent that but little urine escapes through it. An excellent essay on the solvent treatment of calculus is given by Roberts.[1] A kidney-stone may be presumed to be composed of uric acid, or oxalate of lime. For the former the solvent treatment may be hopefully employed, and it will do no harm in the latter instance. Where, however, from the previous passage of oxalate of lime calculi, or the presence in the urine of a considerable number of crystals of the same, there is reason to believe that the concretion is formed of this substance, or where, from kidney-ulceration, the stone is covered with a layer of the secondary (mixed) phosphates, little can be expected from the solvent treatment.

The best method of carrying out this treatment consists in the steady administration of citrate or acetate of potash. The citrate is preferable in doses, for an adult, of not less than forty to sixty grains, well diluted in water. This quantity should be given every three or four hours. On account of the impurity of the citrate of potash, as ordinarily found in the shops, Roberts's plan is to prepare it directly by the combination of citric acid with bicarbonate of potash, as in the following formula:

℞. Potass. bicarb.,	ʒ xij.
Acid. citric.,	ʒ viij. gr. xxiv.
Aquæ ad.,	℥ xij.
M.	

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[1] "Urinary and Renal Diseases," second American edition, 1872, p. 298.

This prescription yields ʒj of citrate of potash to the fluid-ounce. The dose for an adult is from six to eight fluid-drachms, diluted with three or four ounces of water. This treatment should be persisted in steadily for months, or until the symptoms yield. If the stomach tire at the constant administration of alkali, the treatment may be intermitted, to be subsequently resumed. Vegetable bitters and tonics may be administered at the same time.

When there is pyo-nephrosis, with sacculation of the kidney and a tumor which can be felt in the flank, two courses of treatment are open:

1. The general treatment by tonics, astringents, and hygiene, keeping up the patient's strength in every way, and encouraging him to wait for final atrophy of the kidney and desiccation of the pus, using all the means suggested above for chronic pyelitis, with continued suppuration.
2. The operation of opening, or even removing the kidney.

It may often be questionable which method should be adopted. The first has been successful, and may, perhaps, often be so, when only one kidney is involved, when the tumor formed by the distended kidney is not inordinately large, and the general health does not suffer very greatly from the continued suppuration; or, again, when pyo-nephrosis exists, and the kidney is already almost wholly atrophied. On the other hand, this first course must necessarily be pursued when there is reason to believe that both kidneys are implicated, or when the patient's general health is so lowered by the continued suppuration that an extensive operation would probably prove fatal. In certain cases, however, an operation is advisable; where, for instance, there is reason to believe that calculus is the origin of the pyo-nephrosis, and that only one kidney is diseased, and where the general health is good. More particularly is an operation called for when the tumor is very large, and has approached reasonably near the surface, or when there is peri-nephritic suppuration, for, in such cases, by a timely opening, perforation of the pleura, peritonæum, or intestine, may be averted.

If operative interference be decided upon, it is proper to begin with an exploration. This is best made with the aspirator. The exploring trocar is thrust into the most prominent part of the swelling posteriorly, where there seems a natural tendency to point. There is no fear of wounding the peritonæum if the back or flank be perforated, as the kidney is an extra-peritoneal organ. After the matter has been evacuated, search may be made in the cavity with the canula for any calculus which might occupy it. If none be found it is not possible to state that the disease is not of calculous origin; nor, if calculous matter be found, can the converse of this proposition be affirmed with absolute certainty. In Dr. Peters's case (p. 379) the abscess was punctured with the aspirator, pus evacuated, and finally, on withdrawing the instrument, a fragment of stone was found impacted in its extremity; yet, after the kidney had been extracted, the case proved to be one not of calculous pyelitis, but of inflammatory (cheesy) pyelo-nephritis. The patient had pseudo-tubercular epididymitis, with fistula, and pseudo-tubercle of both vasa deferentia and vesiculæ seminales. As a rule, however, if stony matter can be felt, calculous pyelitis may be safely diagnosticated, and an operation rationally undertaken for its relief. If no stone be discovered, but a quantity of pus be evacuated, the operation may be repeated at intervals, to the great relief of the patient. Should stone be found, or even strongly suspected, if the patient's general condition will warrant an operation, nephrotomy should be performed. This consists in cutting down upon the most prominent portion of the tumor posteriorly, or making the same incision as for ablation, opening the sac of the abscess, or sacculated pelvis, turning out the pus it contains and extracting the stone, if there be one. The wound is to be dressed open, to allow all pus and urine to drain freely away. There is rarely any occasion, in simple pyelitis, for ablation of the kidney. With pyo-nephrosis this may sometimes be necessary, but even here, as a rule, it is as well to make a free posterior opening to allow pus and urine to escape, and give the bladder rest.

Extra-renal abscesses should always be opened early, even if no attempt be made to perforate the pelvis of the kidney. The opening, in these cases, should be kept fistulous, and after a time a stone may appear, and be extracted through the fistula. A great number of cases where renal and extra-renal abscesses have been opened, and (often) stone extracted therefrom, to the great relief of the patient, are quoted by Rayer,[1] among which are remarkable, as examples probably of pure nephrotomy for calculus where there was no renal tumor, two cases, both terminating successfully. The first is Paré's case of the archer of Meudon, condemned to death, who had suffered from kidney-stone, where vivisection was made, the peritonæum and probably the kidney opened —nothing is said, however, of the extraction of stone. The patient recovered. The other is the celebrated case of Hobson, who, having kidney-colic severely and frequently, but no tumor, induced Marchetti, a surgeon of Padua, to cut him. The operation was performed, the pelvis of the kidney opened, and two or three little stones extracted. Prompt recovery followed, and after a time the patient's wife extracted a stone from the fistula as large as a date-stone. After this the patient never had any more kidney-pains. Ten years subsequently the fistula was still open, and a probe was passed by Dr. Bernard into the pelvis of the kidney. The patient was in full health, and proposed, on the following day, to take a horseback-ride of forty or fifty miles.

Nearly all authorities are of accord as to the propriety of a speedy opening of extra-renal abscesses; but where the abscess is renal, and it becomes a question of true nephrotomy, i. e., cutting into the substance or opening the pelvis of the kidney, there is great diversity of opinion.

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[1] *Op. cit.*, vol. iii., p. 206, *et seq*

The surgery of the future, however, will be more bold in this direction, since the successful termination of Simon's case of ablation of the kidney,[1] and it may not be too much to predict that more experience will prove that operations on the kidney, in selected cases, where one healthy organ is left behind, will be as generally advocated, and will give results as satisfactory as ovariotomy. Cases are recorded where the kidney has been opened, a stone extracted, the fistula healed, and another successful operation of the same sort performed later upon the same patient.[2] Usually, after nephrotomy, a permanent urinary fistula remains, but sometimes even this may not occur. The advisability of ablation of the kidney in bad cases, and just what circumstances call for it, future experience must decide. As to the unadvisability of nephrotomy, the three rules laid down by Rayer are perfectly good:

1. Do not perform nephrotomy, if there be reason to suppose that both kidneys are diseased; exception to be made for extra-renal abscess, which should always be opened early.
2. Do not operate if the pus find free exit by the bladder, and no renal tumor exist, and if the other kidney be performing its duty satisfactorily. [Future experience may negative this proposition.]
3. Do not operate if the bladder or prostate be incurably diseased, or grave lesions of other viscera exist.

(For Ablation of the Kidney, *see* page 379.)

HYDRO-NEPHROSIS.

When there exists an obstruction, congenital or acquired, to the escape of urine from a kidney, the fluid accumulates in the pelvis of the organ, and may gradually dilate it, leading to atrophy of the secreting structure of the gland, and resulting in a sacculated cyst. Where pus has accumulated instead of watery fluid, pyo-nephrosis, already described, is the result. In those cases where the obstruction is congenital or partial, so that the pressure of accumulated urine is not excessive, but gradual and continuous, pus does not form, and we have true hydro-nephrosis. Hydro-nephrotic kidney sometimes assumes enormous proportions, simulating ascites or ovarian cysts, and as such has been tapped, and its contents evacuated through the abdominal walls. Roberts quotes a case reported by Glass,[3] where thirty gallons of light coffee-colored, limpid fluid were taken after death from a hydro-nephrotic kidney of a young woman. The mother stated that the child was born dropsical. The other kidney was healthy. In a case at Bellevue Hospital, which occurred some years since, the collection was so large as to resemble ascites, and after death several calculi were found in the pelvis of the kidney, one of which projected into the ureter, completely occluding it.

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[1] "Deutsche Klinik," 1870.

[2] Boonhuysen, quoted by Rayer.

[3] "Philosophical Transactions."

Sometimes the cyst is smaller than the healthy kidney (atrophy). Absorption of the secreting structure is usually partial, but may be complete. One or both kidneys may be affected, and, what is remarkable, both kidneys may be largely dilated, and display, on autopsy, not a trace of true renal structure, and yet the urine present nothing abnormal, and the patient live in this condition for a variable length of time. In such cases the urine is usually of low specific gravity, and very abundant, and death may occur at any time with uræmic symptoms. Infants with congenital double hydro-nephrosis do not live (Rayer), but, where the affection comes on gradually, life is possible to a far greater limit than would seem possible *a priori*. It is possible that the skin and bowels do the work vicariously in these cases for the kidneys. The cysts usually contain a fluid, clear or more or less colored by blood, pus, or *débris*. The constituents of the urine are found in it. Sometimes the cysts contain a colloid substance.

Causes.—Hydro-nephrosis is often congenital, depending upon an impervious ureter, or some valvular obstruction of the same. Impervious (congenital) urethra may be the cause; later in life, calculus impacted in the ureter, stricture of the ureter from previous ulceration, pelvic tumors, ovarian cysts, or other body (gravid uterus) compressing the ureter. Sometimes no mechanical cause can be assigned, except a valvular fold of mucous membrane, or great obliquity of entrance of ureter into pelvis of kidney, acting like a valve.

Symptoms.—The symptoms of hydro-nephrosis depend mainly upon the size acquired by the cyst, and the compression exerted by it upon the surrounding organs. If the tumor be small, and the other kidney healthy, no symptom during life may lead to the suspicion of disease, and old age may be attained. When the tumor reaches considerable size, it usually presents itself in the flank, extending backward into the lumbar region, and forward, upward, and downward, to a greater or less extent, into the abdomen. The colon usually lies in front, the small intestines being pushed to the opposite side. The tumor is flat on percussion, feels soft, perhaps lobulated, and is evidently fluctuating. Sometimes the tumor suddenly disappears coincidently with a free discharge of urine. This symptom, when present, is of the highest diagnostic value. Pain is usually absent, unless there be at the same time impacted calculus in the ureter. The action of the bowels may be irregular, dysenteric or diarrhœal, from compression of the large intestine. The urine presents no characters pathognomonic of the disease. It may be absolutely healthy, and is not necessarily increased in quantity.

Course.—The obstacle (possibly calculus) perhaps becomes dislodged in time, and the cyst evacuated. The latter may not refill; its sac may shrivel up. Finally, uræmic symptoms may carry off the patient, but many die of intercurrent disorders. Spontaneous rupture of the cyst very rarely occurs.

The diagnosis in man is with ascites, hydatid cysts, and pyo-nephrosis. In hydro-nephrosis the colon lies in front of the tumor, there is no resonant percussion in the lumbar region of the affected side, but it exists on the other side, unless the disease be double. No change in the patient's position affects the sounds. In ascites, the lumbar dullness is double, but the sounds change with the position of the patient. In hydatid cyst there is escape of hydatid vesicles with the urine, or the presence of hydatid fremitus. Hydatid cyst is less often double than hydro-nephrosis. In pyo-nephrosis there is or has been pus in the urine; the symptoms are more severe, pain is prominent, rigors are common.

Treatment.—The disease, not being as a rule very dangerous to life, does not call for officious surgery. If it be presumed that there is a calculus impacted in the ureter, precautions should be taken to prevent a similar accident on the opposite side. Roberts believes that he was successful in one case in overcoming the obstruction permanently by manipulation. A little girl of eight, under his care, had a soft, fluctuating tumor, on the left side of the abdomen, about the size of a child's head, which was believed to be hydro-nephrosis. This was carefully manipulated in every direction by the aid of a lubricating ointment on alternate mornings. After the third manipulation a large quantity of urine was suddenly discharged through the natural channels, the tumor disappeared, and did not return while the patient was under observation.

If the tumor become excessively troublesome, from its size, especially if it be telling upon the general health by interfering with the functions of the intestines, or show signs of inflaming (the occurrence of chills, etc.), recourse may be had to tapping, which might be cautiously repeated as the sac refilled. Such tappings have been practised through the abdomen, between the last two ribs, near their free extremities, and in other positions. If the tumor bulge considerably in the flank, or lumbar region, behind the colon, the tapping should be performed preferably here, or a point behind between the two floating ribs may be selected, as chosen by Mr. J. Thompson, in an interesting case quoted by Roberts.[1]

In Mr. Thompson's case recovery followed. A year afterward the same operation was repeated. Eight years afterward it was done again. Eighteen months afterward the sac ruptured, discharging into the peritonæum.

For the purposes of tapping, the aspirator is the best instrument. It must be remembered that tapping may occasion inflammation of the sac. There is always hope, in acquired cases of the disease, that the fluid may escape by the natural passages.

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[1] *Op. cit.*

KIDNEY-CYSTS.

Several forms of cysts are found in the kidneys.

Simple cysts by occlusion in the healthy, or more often the granular kidney, rarely large enough to occasion appreciable symptoms during life. Complete cystic degeneration of the kidneys, congenital, and occurring very rarely in adult life, almost invariably affecting both kidneys, and necessarily fatal.[1]

Of the *entozoa* found in the kidney, hydatid cysts only come under the surgeon's notice. They are not as common as hydatids of the liver or lungs, but are more frequent than hydatids of other parts of the body. Space will not allow a description here of the history and habits of this interesting entozoon.

Both kidneys are rarely involved in hydatid disease; the left seems to suffer more frequently than the right. The cyst may be primarily lodged in any portion of the kidney-substance, which it gradually destroys by pressure as it grows. It forms a rounded, elastic tumor, and may reach the size of an adult head. The cyst tends to point inward, and burst into the pelvis of the kidney, but may grow to a large size without so doing, and eventually discharge into the intestines or the lungs. Kidney hydatid cysts have not been known to discharge into the peritoneal cavity, or externally through the integument. The cyst may inflame, or excite abscess in its vicinity; the echinococci may die, and the cyst shrink and be transformed into a calcareous mass, either before or after bursting. The cyst may be ruptured by external violence.

Symptoms.—Until the cyst grows large enough to be felt or seen in the flank, there are usually no symptoms. Febrile attacks, with rigors and pain, are occasioned, if the cyst or its neighborhood inflame or suppurate. The only pathognomonic symptoms are the hydatid fremitus on palpation, and the appearance of the characteristic vesicles, laminated shreds, or hooklets, in the urine. The hydatid fremitus is rarely perceived. It may sometimes be obtained by grasping the tumor with one hand and tapping the fingers sharply with the other hand; or by applying a stethoscope over the tumor while the latter is tapped smartly with the fingers. The sensation is a sort of a creaking vibration or thrill communicated to the fingers, and has been compared to the vibrations of a repeater-watch held in the hand. The discharge of characteristic vesicles by the urethra, when a cyst has burst, is usually spread over a considerable length of time, the discharges occurring in paroxysms, occasionally with an interval of years; if there is only one small cyst, it may empty itself in one paroxysm. These paroxysms usually begin with pain in the back, followed by nephritic colic, as the vesicles pass into the bladder, and perhaps retention of urine, and considerable pain, as the larger vesicles traverse the urethra. The urine usually, at such times, contains blood and pus, and there are symptoms of mild cystitis of the neck of the bladder. The tumor in the flank may become smaller after such an attack, from a discharge of some of its contents, or increase in size by distention with urine, if a vesicle be retained for a time in the ureter. The disease is most liable to be confounded with hydro-nephrosis, in case no vesicles appear in the urine.

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[1] In a practical work covering as much ground as does the present, it is impossible to more than indicate the existence of this rare form of disease, although it naturally falls within the domain of surgery. It is very rarely encountered, and totally unamenable to treatment. For its study the reader is referred to text-books on renal disease, and pathological works, in which it forms interesting chapters.

Prognosis.—The natural tendency of the disease is to get well by a discharge of the echinococci through the ureter. The mortality is lower than for hydatids of any other internal organ except the uterus. Where the cysts discharge by other routes, or become inflamed and suppurate, a fatal result is to be feared, although even in such cases recovery is possible.

Treatment.—Medicines are of no avail before the cyst has opened into the pelvis of the kidney. Nitre, coffee, white wine, spirits, and, in general, diuretics, have sometimes been found to increase the quantity of hydatids appearing in the urine after the opening of a cyst. If the cyst attain a large size, and do not burst into the pelvis of the kidney, operative procedure should not be undertaken, unless there seem to be imminent danger of its bursting in some undesirable direction, or unless it be pressing dangerously upon the pleural cavity, or causing considerable disturbance by pressure on the intestine.

If it be decided to open the cyst, such opening should be made posteriorly, in the loins if there be any bulging there, preceded preferably by an exploratory tapping. When the bulging is in front, the opening should not be made until the skin and abdominal tissues have been destroyed by caustic, and inflammatory adhesions excited between the two layers of peritonæum covering the tumor. Then a puncture may be made with a trocar, the opening afterward enlarged with a bistoury, the contents of the tumor allowed to escape, and daily injections of the sac practised with mild, warm solutions of carbolic acid, or chlorinated soda, with an occasional injection of a solution of iodine. In this way desperate cases have been occasionally brought to a happy termination.

TUBERCLE OF THE KIDNEY.

This is a disease, on account of its comparative rarity, more interesting to the pathologist than to the practical surgeon. It occurs in two forms:

1. As small miliary granulations of true tubercle deposited rapidly in acute general tuberculosis occupying the secreting structure and pyramids. The little nodules are deposited mainly along the course of the smaller vessels. This species is only a part of acute miliary tuberculosis.

It rarely furnishes local symptoms, and is usually discovered after death. As a kidney-disease it is unimportant.

2. The kidney tuberculosis which constitutes a disease to be diagnosed and treated during life, is a more chronic form, which generally commences by a deposit of gray tubercular matter upon the papillæ, thence passing to the mucous membrane of the calices. The gray nodules first infiltrate a portion of tissue, then undergo a cheesy degeneration, and break down into tubercular ulcers, which advance inwardly, destroying every thing in their course. The pelvis and ureter participate in the disease, perhaps primarily, but certainly in the course of time. The disease is comparatively rare, and not infrequently coincides with the deposit of tubercle elsewhere, especially in some other portion of the genito-urinary apparatus (prostate, epididymes, seminal vesicles). All ages are liable to it, but it is most common in early manhood. It comes on usually in an insidious manner. The little tubercular masses unite to form large patches. Kidney-substance is absorbed, to be replaced by the lowly-vitalized tubercular matter. After a while the masses soften centrally, break down into a puriform matter, and leave ragged ulcers in the kidney-substance, or in the walls of the pelvis. Rarely these ulcers or abscesses heal, leaving a depressed cicatrix. Some ulcerations may cicatrize, while others progress. The fibrous structures of the ureters and pelves of the kidneys become greatly thickened and indurated by chronic inflammation, so that the calibre of the ureter may be nearly or quite obliterated. The ureter so constricted may become blocked up by some softened tubercular matter or tissue *débris*, coming down from above, in which case pyo-nephrosis would in all probability result, with symptoms of nephritic colic at the beginning. A stone formed in the kidney may be unable to pass the contracted ureter, or, from decomposition of the urine retained in the kidney in contact with the tubercular ulcerations, phosphatic stone may be formed there. Under any of these contingencies the symptoms would resemble those of chronic calculous pyelitis. The disease is more frequently double than single. Sometimes, however, it is found on one side only, and then it not unusually happens that the testicle or epididymis of the same side also suffers. There is an undoubted connection in the male sex between tuberculization of the genital organs and that of the kidney. The attack of the former usually precedes that of the latter, and seems to hold a certain causal relation to it.

Symptoms.—The symptoms are identical with, and in fact are, those of chronic pyelitis, with or without severe nephralgia or nephritic colic. It is rare that much or any pain is felt at first, the disease most often coming on insidiously. There are exceptions to this rule, when, for instance, a large, acute deposit is attended by great local pain, fever, bloody urine, etc.

If pyo-nephrosis comes on, the tumor or sacculated abscesses may be felt in the flank. As the disease progresses the nephralgia becomes more marked, as do also the accompanying symptoms of cystitis. Great emaciation, with rigors and hectic fever, supervenes, and the patient dies exhausted, or, from the bursting of kidney-abscess, possibly with uræmic symptoms, or, from tubercular disease elsewhere, wasted by hectic. There is rarely any profuse hæmaturia with kidney tuberculosis. The urine is almost uniformly over-acid. The disease may prove rapidly fatal in a few months, or may drag along several years.

Diagnosis.—The most reliable diagnostic marks of this affection are chronic pyelitis coming on in a tubercular subject, or one of tubercular antecedents, or living in bad hygienic surroundings, where no other cause (stone, etc.) for the pyelitis is evident. Where the epididymis is the seat of cheesy degeneration, or the seminal vesicles knotty with chronic, cheesy deposit, or the prostate affected by similar disease, and symptoms of chronic pyelitis come on, a diagnosis of tubercular pyelitis may be safely ventured. The urine usually contains a large amount of *débris* besides its pus, but, taken by itself without the co-relation of other symptoms, this sign is absolutely valueless.

Treatment.—Tubercular disease of the kidney is very rarely recovered from; it is even more fatal than tubercle of other vital organs. Its treatment is that of chronic pyelitis, and that of chronic tuberculosis—fatty medicines and food, proper hygiene in air, clothing, and diet, with quinine, iron, astringents, and, if the pain be great, a small amount of anodyne. Renal and extra-renal accumulations of pus may require external incision. Extirpation is not to be thought of, unless there is pretty positive evidence that one kidney is sound, which is rarely the case.

CANCER OF THE KIDNEY.

Cancer of the kidney is not a common disease. It occurs primarily in the kidney or in general cancerous cachexia as a secondary deposit, especially secondary to cancerous disease of other parts of the genito-urinary apparatus, in which case it often fails to furnish any symptoms, and is to be detected only by autopsy. Again, secondary cancer of the kidney may assume primary rank, and lead to the fatal issue by its rapid growth. Secondary deposits occurring in connection with cancer, other than of the genito-urinary organs, usually affect both kidneys in the shape of numerous nodules, from the smallest imaginable size up to that of a nut or larger. These nodules as a rule occasion no renal or vesical symptom, there being enough tissue left to perform the function of the kidney. Their softening and ulceration may not have time to take place, on account of the more advanced condition of the primary cancerous deposit, which carries off the patient by cachexia or otherwise.

Cancer of the kidney is almost without exception encephaloid (soft); epithelial and other forms being mentioned as curiosities in surgery, No time of life is exempt from an attack of primary cancer of the kidney. Children under four years seem especially liable, and old age the next most frequent epoch for its appearance. As a rule only one kidney is affected. The disease may advance until the mass has reached a size large enough to fill the whole abdomen, and a weight of twenty to thirty pounds. It always seems to begin in the cortical substance, extending thence to the pyramids. The kidney-substance as such becomes absolutely obliterated, no trace of it being left in the large cancerous mass, which, like other specimens of soft cancer, is usually lobulated, harder in some parts than others, of different consistence in different specimens, giving obscure or real fluctuation in parts, often containing large cavities filled with clots, fluid blood, or cancer *débris*, possibly pus, "a strange, distempered mass" (Hey). Cancer of the kidney, like that of the liver and testis, is commonly filled with numerous, large, thin-walled vessels which readily break, forming blood cysts and clots of large size. Kidney-cancer sometimes grows out through the renal vein and advances into the ascending cava. Here portions of it may be broken off and be carried along in the general circulation to form infarctions in the lungs. When the cancerous mass sprouts out into the pelvis of the kidney, its large, thin-walled vessels are apt to give way and occasion that symptom so characteristic of cancer—profuse, spontaneously-recurring hæmorrhage, often filling the bladder to distention with clots.

The disease may commence as a single cancerous nodule, or as an infiltration. When the tumor reaches large size, it usually forms inflammatory adhesions with all the surrounding viscera. The colon lies in front of it, the other viscera are crowded aside. The pressure of the cancerous mass may cause caries of the vertebræ. The ureter is often occluded. When the disease in the kidney is primary, secondary deposits are apt to occur in the rest of the body. The lymphatic glands in the hilum of the kidney, and the vertebral and mesenteric glands, are often involved, sometimes forming a considerable tumor of themselves.

Symptoms.—The most constant symptom of primary renal cancer is a tumor, often in adults, and, as a rule, in children attaining enormous proportions before death. This tumor is first noticed in the flank above the crest of the ilium, growing forward and upward. It usually feels irregular but smooth (lobulated), and generally gives the sensation of deep fluctuation at points. It may be entirely painless to pressure. The resonance of the colon passing in front of it may often be made out. Pain in the back and hypochondrium, in the region of the kidney, of the nephralgic character, is usually complained of before the tumor appears, perhaps not till later. The pain is usually intermittent in character, and not often very intense. It may be wholly absent. Hæmaturia is a sign of great value, when present, but its absence has not the signification which has been given to it. It may be absent throughout the disease, or appear for a time only at the beginning or at the end. It is rarely continuous throughout, tending, as it does, to be irregularly intermittent without appreciable cause. Often during the paroxysms it is very profuse, perhaps clotting in the ureter or bladder, and causing considerable inconvenience and pain. If distressing feelings have been present, some alleviation of them is apt to follow profuse bleeding. When hæmaturia is abundant and paroxysmal without provocation, in the case of renal tumor, cancer is pretty certain to be the cause.

Among other symptoms there may be ascites, anasarca, and great development of the cutaneous abdominal veins, from pressure of the tumor upon the large venous trunks within the abdomen. The size of the tumor may cause functional derangements of the stomach and bowels. Vomiting sometimes appears early. The urine presents no characteristic diagnostic features. It is idle to place any reliance upon the appearance of so-called cancer-cells in the urine, or upon the hope of finding a shred of cancer-tissue, since such a shred, starting at the kidney, already softened and partly decomposed by the ulcerative process which

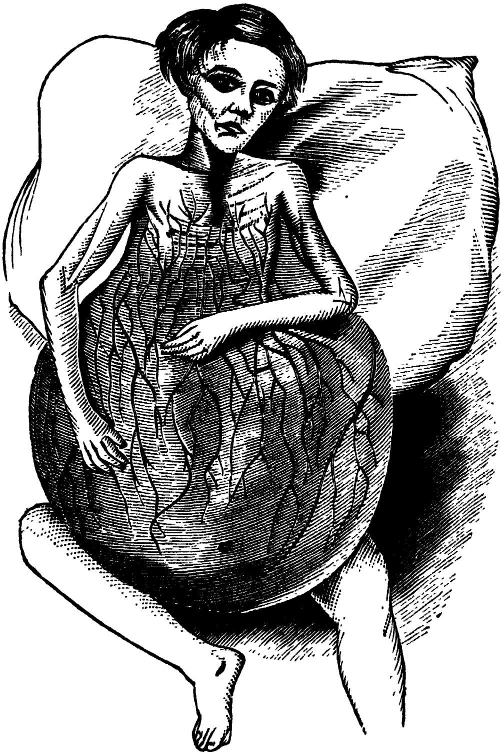

FIG. 124.—(*Roberts.*)

loosened it, would become wholly indistinguishable as a portion of cancer after traversing the ureter and remaining soaked in urine in the bladder for even a short time. In children the disease is more rapidly fatal than in the adult. It rarely lasts over a year. The tumor grows to an immense size, not infrequently fills the whole abdomen. The patient emaciates rapidly and dies.

Fig. 124 is an excellent representation of a child with advanced cancer of the kidney.

Adults with cancerous kidney usually die in two or three years, but many drag out more than double that length of time (Roberts). Cancerous cachexia is more liable to be marked in the adult than in the child.

The diagnosis in the male is with ascites, hepatic or splenic tumor, or renal tumor of other nature (hydro-nephrosis, pyo-nephrosis, hydatid). In ascites fluctuation is distinct, both loins are flat, the dullness may be made to change by position. A kidney-tumor is immovable, feels solid in parts, only one flank is flat on percussion. A tumor in connection with the liver does not have the colon in front of it. A kidney-tumor can usually be separated from the liver unless adhesions have formed; perhaps a line of resonance will exist between them. A splenic tumor does not have the colon in front; it grows more upward than downward; resonance may be heard in the flank behind it; its border may be felt stiff and thinnish; deep percussion will elicit the bowel-sound beneath (for the spleen is not a very thick organ); the history will show previous malarial poisoning.

For diagnosis with other renal tumors, the previous history, presence or absence of cachexia, existence of pus or hydatids in the urine, sudden decrease of the tumor after free urination, etc., form the distinguishing points.

Treatment.—The hæmaturia, if excessive, calls for treatment, as may also the nephralgia. As the disease is so often confined to one kidney for a length of time, without infecting neighboring glands or other parts, it belongs to the surgery of the future to decide whether, in a case recognized very early, ablation of the kidney might be a justifiable operation.

ABLATION OF THE KIDNEY.

The successful case of removal of the kidney by G. Simon,[1] of Heidelberg, has been followed by other operations, but as yet by none of fortunate issue. Simon's case was that of a woman, aged twenty-six, whose kidney was healthy, but the ureter had been divided in ovariotomy. To cure the resulting urinary fistula, the kidney was removed and the woman recovered.

G. A. Peters,[2] of New York, removed a kidney five and three-quarter inches long by three broad. The patient failed to recover. Dr. Peters's paper upon the subject is interesting and full, and contains a report of certain cases (three in number) where a similar operation had been performed previous to the date of his own. The operators were Simon, Linser, and Durham. Dr. Peters's method of reaching the kidney was simple and effective. An incision six and three-quarter inches long was made from the twelfth rib to the crest of the ilium, three inches from, and parallel to, the vertebral spines. The outer border of the quadratus lumborum was thus easily reached, and, through the fat beneath it, the kidney. This was gradually enucleated and removed, after tying the vessels.

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[1] "Deutsche Klinik," 1870.

[2] *New York Medical Journal*, November, 1872.

SYPHILIS OF THE KIDNEY.

The kidney is occasionally the seat of syphilis. Lancereaux,[1] in twenty autopsies of patients with visceral syphilis, only found the kidney affected in five cases; four with interstitial nephritis, and one with gummy tumor; several with cicatrices. Virchow[2] believes that amyloid degeneration of the kidneys may depend directly upon syphilitic cachexia.

Kidneys affected by syphilitic disease do not furnish any symptoms which can distinguish the malady from other forms of slow nephritis; more or less albumen, in a fluid of low specific gravity, with usually a few pale casts. There are no distinctive, subjective symptoms. Such patients are liable to slight morning nausea. Sometimes recoveries occur, under treatment. An occasional case of albumen in the urine, which has disappeared under anti-syphilitic treatment, may be found recorded in the journals.[3] But, on the other hand, it will occasionally happen that patients with visceral syphilis, under protracted treatment, by large doses of iodide of potassium, will gradually show morning nausea, and upon examination their urine will be found light, slightly albuminous, and containing pale casts. In such cases the kidney-trouble is probably due to the irritation produced by the large amount of iodide of potassium passing through them, and the albumen and casts may be made to disappear, together with the morning nausea, by reducing the activity of the treatment. Several such cases have fallen under the authors' observation.

The pathological appearances of syphilitic kidney, besides amyloid degeneration, which may be found, perhaps due to the disease, are those of interstitial chronic inflammation (usually circumscribed), local cirrhosis (rarely general), thickening of the parenchyma and capsule, perhaps local fatty degeneration, with atrophy, the tough adherent capsule being depressed in deep seams, the kidney stroma compressed, atrophied, and degenerated between portions of contracted connective tissue.

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[1] *Op. cit.*

[2] "Die krankhaften Geschwülste," vol. ii., p. 471.

[3] Ollier, quoted by Rollet, p. 278.

These appearances may be found alone or combined with one or more yellow gummy nodules, of varying size, solid, or more or less softened. Such nodules are usually connected to white bands of hypertrophied connective tissue, running through the kidney. The gummy nodule is pathognomonic; the chronic interstitial nephritis is distinguished from the usual form by being generally confined to circumscribed portions of the gland.

The treatment of cases suspected to be syphilitic is that of tertiary syphilis.

CHAPTER XXI.

DISEASES OF THE SCROTUM.

Anatomy.—Injuries.—Œdema.—Emphysema.—Eczema.—Intertrigo.—Pityriasis.—Eczema Marginatum.—Pruritus Genitalium.—Pediculi Pubis.—Phlegmonous Erysipelas.—Elephantiasis.—Tumors and Cancer of Scrotum.—Epithelioma.

The scrotum is a pouch formed of skin, muscular and connective tissue. Its function is to contain and support the testicles. It is developed from two lateral halves which unite centrally in the raphe (*ῥάπτω, I sew*), a raised line continuous with the raphe of the penis and that of the perinæum. The lateral halves sometimes remain separated and resemble labia majora, giving rise to an appearance suggestive of hermaphrodism. The healthy scrotum in the young man is thrown into rugæ at right angles to the raphe on either side, by the contractions of the dartos.

The integument of the scrotum is delicate in structure, covered with a few hairs, and apt to become pigmented at puberty. The sebaceous glands are very large.

The dartos is a layer of unstriped muscle. It lies beneath and firmly attached to the integument, and is reflected on either side inward from the raphe, to form the septum scroti. Each testicle has thus a dartos of its own. On exposing the scrotum to the air, the vermicular contractions of this muscle can be readily seen. They occur under the influence of cold or fright, and during the venereal orgasm. In youth, especially in winter, the dartos is habitually contracted and holds the testicles well up under the pubes. The ancient sculptors did not fail to notice that contraction of the scrotum was a mark of general as well as of sexual vigor. In the aged and infirm, on the other hand, especially during summer, the muscle relaxes, allowing the testicles to hang low, supported mainly by the cord.

The connective tissue of the scrotum is peculiarly loose, and contains no appreciable amount of fat. The septum scroti is pervious to fluids, so that serum or infiltrated urine can find its way readily from one side to the other. The lymphatics of the scrotum are large and numerous, and lead to the inguinal glands. The scrotum develops independently of the testicles, but, if the latter fail to descend, it is always rudimentary.

INJURIES OF THE SCROTUM.

In contusions, extensive ecchymosis is liable to occur, on account of the laxity of the connective tissue. These should not be incised. The parts should be supported and covered with cool lead-water, to which a little spirit has been added, or laudanum, if there is pain. Absorption may be pretty confidently expected.

In wounds of the scrotum there is usually a great deal of bleeding. In uniting such wounds, many sutures are required, to overcome the tendency of the dartos to pull the edges apart. Abscess of the scrotum after injury requires no comment. An early opening is advisable.

CUTANEOUS AFFECTIONS OF THE SCROTUM.

Nearly all of the numerous diseases, syphilitic or otherwise, of the general integument, may occur also upon the scrotum. Certain of them are modified by their position, and require a passing notice.

Extensive œdema is liable to complicate any inflammatory affection of the scrotum—on account of the laxity of its tissue, and its dependent position. Scrotal œdema may also be due to any obstruction to the return of its blood, as occasionally to the hard inflammatory induration around inflamed lymphatic glands in the groin, or it may come on in connection with general prostration and anasarca.

Where œdema is excessive, and the tension is so great that injury to the skin seems imminent from pressure, a few punctures may be made on either side of the raphe, at the most depending point of the scrotum. These incisions, however, should be practised with caution, as there is danger of their being followed by gangrenous erysipelas.

Emphysema of the scrotum is occasionally met with. It is easily distinguished by the crackling under the fingers, and resonance on percussion. It occurs with general subcutaneous emphysema, and with scrotal gangrene.

Eczema.—Eczema attacking the scrotum, perinæum, and thighs around the root of the scrotum, is apt to be excessively obstinate, and prone to relapse. (For treatment, *see* text-books on dermatology.)

Intertrigo occurs in children, and often in fat men of rheumatic habit who perspire a good deal. This affection is apt to be troublesome. Much can be done to prevent it, by scrupulous cleanliness, and the use of a suspensory bandage, to keep the cutaneous surfaces apart. To overcome the hyperæmia, when it exists, rest, cleanliness, and exposure of the parts to the air, are speedily effective in mild cases. If the surface is moist, and excoriated, it should be dusted with equal parts of finely-powdered oxide of zinc, camphor, and starch, or with simple rice-powder, or may be dressed with the oxide-of-zinc ointment. A strip of old thin linen should be used to sling up the scrotum, and keep the cutaneous surfaces apart. Later, when the parts are dry, tincture of iodine, locally, will hasten the cure. Avoidance of stimulating food and drink, to render the secretions less irritating, is advisable.

Pityriasis.—In men with a delicate skin, especially in summer, there is often a slightly brown discoloration of the thigh, and of the scrotum, where the two surfaces lie habitually in contact, caused by a vegetable parasite in the upper layers of the epidermis. It is, in fact, a pityriasis versicolor, and sometimes gives rise to a mild local erythema, and considerable itching. A few applications of the compound tincture of iodine diluted to half strength, and painted on after the affected skin has been washed with soap, and dried (to remove the fat from the scales and spores), will cure the discoloration and the itching.

ECZEMA MARGINATUM.—This is another parasitic disease, affecting the scrotum, thighs, mons veneris, and buttocks. It is not an eczema, but a herpes tonsurans vesiculosis—a combination of herpes tonsurans and intertrigo, as proved by Pick,[1] in a written discussion with Hebra. The eruption commences in one or more small, round patches, red, elevated, and itchy, just where the scrotum lies habitually in contact with the thigh. It spreads circumferentially, healing in the centre. The border of the eruption is sharply defined, and forms the distinctive feature of the disease. It is composed of papules, vesicles, excoriations, and crusts. The parts within this festooned border, over which the disease has passed, are left of a brown color. Often, little heaps of dried-up scales lie here and there upon this surface. Patches of eruption break out in the neighborhood, or within the border, and behave exactly like the patches first constituting the disease. The affection is slow in getting well, and tends strongly to relapse. Friction and moisture of the parts, together with the parasite, are necessary for its production. Among the scales scraped from the margin, the microscope may detect the moniliform filaments and spores of the tricophyton of Malmster, the parasite of ordinary ring-worm. In certain stages of the disease, the parasite is difficult to find.

Treatment.—Dilute lead-water, or oxide of zinc; ointment may be used locally at first if there be much inflammation of the skin, to be followed by parasiticide lotions, or the latter may be commenced with at once. The best of these is a mild solution of corrosive sublimate in water, gr. j–jss to the ℥ j, which should be kept constantly applied. If mercury be objectionable, tincture of iodine may be used, or an ointment of turpeth mineral (hydrarg. sulph. flav.) gr. x–xx to the ℥j. Treatment should be kept up for some time after apparent cure, as relapses are the rule, and can only be averted in this way.

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[1] "Zur Verständigung über das sogenannte Ekzema Marginatum," Archiv f. Derm. and Syph., 1, iii., p. 443.

Pruritus Genitalium.—This, like other purely pruriginous skin-affections without eruption, is excessively obstinate. Rheumatic and gouty subjects most often are the sufferers, and, with such, any dietetic or hygienic errors seem liable to induce or aggravate the disorder. After the exclusion of animal or vegetable parasites from the *rôle* of causality, the treatment consists in hygienic and dietetic precautions, with the internal exhibition of alkalies, and, if need be, tonics. Turkish and Russian baths are often very serviceable.

The following are among the most generally useful local measures, what is suitable for one case often having no effect upon another. Hygiene and change of air are sometimes the only really curative agents.

Hot water, tar, pure or in combination, yellow wash—

Or—

℞. Chloroform., ʒj.
Adipis, ℥j.
M. Keep corked in a wide-mouthed bottle.

Or—

℞. Acid. hydrocyanic. dil., ʒss–ʒj.
Glycerini,
Aquæ, āā ℥ss.
M. Ft. lotio.

Finally, local electricity, either the induced or the continued current, has decided curative power over some cases.

Pediculi Pubis.—These parasites may be found upon the scrotum, as they may, in fact, upon any part of the body from which the hairs of puberty grow. They exist in greatest abundance, however, about the genitals, and particularly on the mons veneris. They are plainly visible to the naked eye, as are their eggs attached to the hairs (Fig. 125, *a*). They may be destroyed by sprinkling the parts with calomel, or by applying a lotion of gr. j–iij corrosive sublimate to ℥j of Cologne-water, or a wash made of equal parts of tincture delphinii and water, or of hyposulphite of soda and borax, each ʒj to ℥j. When they infest the whole body, some few usually escape the ordinary application of lotions, and these soon breed a new crop. Care and patience, however, will always finally dislodge them.

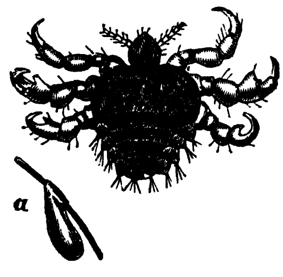

Fig. 125.

Urinary Infiltration has been already described.

Phlegmonous Erysipelas.—Upon the scrotum this is an exceedingly dangerous disease. It is most frequently observed in the aged or debilitated, chiefly as the result of cold. A method of acquiring it, which is almost classical, is for an old man to come out of a hot room into the open air to urinate. The cold air strikes upon the part, chills it, and within twenty-four hours phlegmonous erysipelas of the scrotum commences. Injuries and operations may also be occasionally attended by it. The so-called metastatic inflammations occurring in typhus, variola, scarlet fever, mumps, etc., are in reality phlegmonous erysipelas, described by some English authors as acute œdema.

Symptoms.—A sharp chill announces the disease. The scrotum becomes at once the seat of increased heat and redness, with pain, and rapidly enlarges. Blood escapes into the subcutaneous connective tissue, so that the whole scrotum may be black and shining, or its color may be mottled. The scrotum may reach the size of a child's head, the integument is put upon the stretch, the epidermis may crack or may be raised into vesicles or bullæ. The general tendency of the disease is always toward gangrene. Pain is not very great, but the prostration is excessive. The pulse runs up to 120–160, is small, feeble, and irregular. The appetite fails, the tongue gets brown and dry, the patient breathes hurriedly, is depressed and overcome. The skin is hot and dry at first, but becomes subsequently moist from depression.

The diagnosis is between infiltration of urine and hæmatocele. From the former it may be distinguished by the greater severity of the attack, the rapid change of color of the parts, the fact that one side of the scrotum is more seriously involved than the other in phlegmonous erysipelas, and that the œdema does not so certainly extend to the penis and abdomen. The patient is more depressed, and no preëxisting cause for infiltration is present. In true hæmatocele one side only of the scrotum is enlarged, and there is not much thickening of the skin. The swelling may be often made out as involving the testicle. The general symptoms in hæmatocele are not formidable. The dangers in phlegmonous erysipelas of the scrotum are twofold: the life of the patient is in danger; the integrity of the scrotum is at stake; any portion or the whole of it may slough, leaving the testicles uncovered.

Treatment.—The treatment should be energetic and supportive. Repeated small doses of brandy, whiskey, or wine, must be given, with milk, cream, and beef-tea. The quantity of stimulant varies in every case. Eight or ten ounces of brandy or whiskey in twenty-four hours, in small portions at a time, is a fair average quantity. A good effect of the stimulant will be noticed in the pulse, which will decrease in frequency and become more strong and regular. The tongue will get moist, and the patient rally from his depression.

The local treatment is equally important. Hope of aborting the disease need not be entertained. One long, free incision parallel to the raphe, on either side, should be made well down into the subcutaneous tissue of the œdematous discolored mass. Persulphate of iron may be used, if necessary, to check bleeding, and water-dressings, with one per cent. carbolic acid, applied. If gangrene has already commenced, and sloughs begun to separate, or if the latter form in spite of the incision, they should be detached and removed as soon as possible. The testicles hang out uninjured in these cases, suspended by the cord, and if left to themselves and kept moist, or, perhaps better, mildly stimulated, granulations will sprout out upon them, and a cicatrix will form, binding them up under the pubis in a manner not unsightly nor inconvenient. The patient is always agreeably disappointed in the final result. If the process of repair does not form a good scrotum, recourse may be had to oscheo-plasty (*ὀσχέον, scrotum; πλάσσειν, to form*), as performed by Delpech, Dieffenbach, Dürger, and others, by transplanting from neighboring parts flaps of skin large enough to cover in the testicles.

ELEPHANTIASIS SCROTI.—This disease, not uncommon in some portions of the globe, is rare in the United States. Hypertrophic overgrowth may attack the scrotum or penis alone, but usually both are involved, the scrotum to the greater extent. The scrotum may enlarge until it touches the ground. It has been known to reach the weight of one hundred and sixty-five pounds! A scrotum of this weight was removed by Wilkes.[1] The only remedy for the disease is the knife. Curling[2] advises a disregard of the penis and testicles in operating, if the tumor be very large. Patients are apt to die on the table, from hæmorrhage, which is always excessive. If the mass is not excessively large, the penis, testicles, and cords, may be dissected out, enough of the healthiest tissue being left to cover them. Many cases of successful operation are recorded, among others, one by Thebaud, of New York, the mass weighing, when removed, sixty-three pounds.

Cystic, fatty, and fibrous tumors of the scrotum are found occasionally. Small steatomatous cysts are common. They may reach a large size.

CANCER OF THE SCROTUM, in this country, is a rare disease. When it occurs, it is almost invariably epithelial. Scirrhous and medullary cancer, recurrent fibroid, and melanotic sarcoma, are encountered at long intervals, but not as differing in any way from the same growths elsewhere.

EPITHELIOMA OF THE SCROTUM has been denominated chimney-sweeps' cancer, since it is somewhat common in England upon chimney sweepers. Soot seems to be the exciting cause in England, although in other countries those whose occupation brings them into contact with this substance do not seem to suffer. On the contrary, our countryman, Warren,[3] states that he has seen it a few times in the United States, but never in chimney-sweepers. Coal-dust is entirely inoperative.

The disease begins as one or more small, soft warts, or tubercles, usually at the lower fore-part of the scrotum. These remain unchanged for a time, but finally indurate slightly, become excoriated, scab over, and ulcerate, the ulcer extending backward, and destroying, with more or less rapidity, the whole scrotum. Sometimes the testicles are involved, sometimes they escape. The ulcer resembles an epithelial, cancerous ulceration, wherever seen. It has the same hardened, irregular, purplish, everted, knotty borders; the same hard, uneven, unhealthy-looking base; the same ichorous discharge, now sanguinolent, now purulent.

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[1] Titley, "Diseases of the Genitals," p. 317.

[2] "The Testis"

[3] "Surgical Observations on Tumors," p. 329.

Death occurs by exhaustion, or by hæmorrhage, if a large vessel be severed by the advancing ulceration. The disease continues local for some time. It is only tardily that the inguinal glands become involved.

Treatment.—Thorough removal with the knife offers the only chance for safety. If the inguinal glands have not become infected, the operation is a simple one. If either testicle should be found involved, or even adherent to the diseased mass, it should be removed. If the glands in the groin are greatly enlarged and indurated, operation is unadvisable. If they are only slightly enlarged, they may be left; but, if they are at all indurated, they too must be removed. The earlier the operation is undertaken the less the chance of relapse, which is always to be feared. A second and third operation may be advisable, if the patient's general condition be not seriously impaired.

(For mucous patches of the scrotum, *see* SYPHILIS.)

CHAPTER XXII.

DISEASES OF THE TESTICLE.

Anatomy.—Anomalies.—Cryptorchidism.—Hypertrophy.—Atrophy.—Injuries.—Hæmatocele.—Hæmatocele of the Cord.—Free Bodies in the Tunica Vaginalis.

THE testicles, suspended each by its spermatic cord, lie loosely in the scrotum, surrounded by an atmosphere of connective tissue. The left is usually slightly larger than the right and hangs lower, evidently for the purpose of allowing these important organs the more readily to elude violence. It has been observed, in transposition of the viscera and blood-vessels, that the right testicle hangs the lower. The mean dimensions of the testicle, according to Curling, are one and three-fourths inch long, one and a fourth inch antero-posteriorly, and one inch laterally. The average weight in the adult is about six drachms. The dimensions, weight, and consistence, vary considerably, according as the organ is in action or not. During venereal excitement it is turgescent, firm, and elastic; otherwise soft and yielding. Two of the envelopes of the cord also cover the testicle, the cremaster muscle, and the tunica vaginalis communis, while the remains of the gubernaculum testis attach it to the bottom of the scrotum.

The proper coverings of the testicle are two—the tunica vaginalis testis and the tunica albuginea. The former is a shut serous sac, investing all the secreting portion of the testicle, except where the epididymis is attached behind, and the remains of the gubernaculum below. It dips down in the middle posteriorly, between the epididymis and the testicle, forming a *cul-de-sac*, at the bottom of which the sac on the two sides comes into close contact, and sometimes there is a communication at this point. On the outer side the tunica vaginalis covers and closely invests the epididymis. The reflected layer forms a shut sac, and this extends up the cord to a greater or less extent. This tunica vaginalis represents a portion of the peritonæum which was brought down by the testicle in its descent from the abdomen. Ordinarily, at birth, all connection between its cavity and that of the peritonæum is closed, a white, fibrous line (habenula) alone marking the original continuity of membrane. Sometimes, however, the opening remains permanent, in which case congenital hernia is likely to occur. The communication may be a narrow canal, open only to the passage of fluid. Again, partial obliteration may exist, isolated serous sacs being left along the cord. Finally, as more often happens, the upper aperture is closed, and a considerable portion below remains unobliterated, so that the tunica vaginalis extends for some distance upward in front of the cord. The cavity of the tunica vaginalis is lined by pavement epithelium, and normally contains only enough fluid to lubricate the surfaces. The function of the sac is to allow the testicle to slip easily away when in danger of being pinched.

The tunica albuginea is the proper investing membrane of the secreting portion of the testicle. In its substance the branches of the spermatic artery ramify, and break up to be distributed to the seminal tubules within. It is composed of dense, white, fibrous tissue, is only slightly extensible (whence the pain in orchitis), and sends trabeculæ into the substance of the testicle to break it up into compartments (about four hundred for each testicle), for the lodgment of the ultimate tubuli seminiferi. It forms the rete testis (corpus Highmori) above and behind, where blood-vessels and absorbents pass to and from the testicle, and where the straight tubes come out to form the coni vasculosi—together, the head of the epididymis.

The glandular substance of the testicle consists of innumerable little tubes (tubuli seminiferi) closely packed in conical segments between the fine, fibrous septa thrown out by the tunica albuginea. The number of these cones is computed to be from 250 to about 500, and their combined length from 1,000 to 5,500 feet. The diameter of the tubules has been variously estimated at from $\frac{1}{18}$ of a line (Müller) to $\frac{1}{15}$ of a line (Lauth). Their mean length is estimated by Lauth at 25 inches.[1]

The tubes are all of the same size throughout, and anastomose frequently with their fellows of the same cone, and with those of neighboring cones. They are lined with mucous membrane furnished with polygonal cells, containing spherical nuclei. These cells are the active agents in forming the spermatozoa, the ciliated cells (so-called animalculæ) always found in health after puberty, free in the tubes in greater or less number, according to circumstances.

The *epididymis* (*ἐπί, upon ; δίδυμος, testicle*) caps the testicle proper, and skirts its posterior border. It is large and spread out above, being composed of the coni vasculosi or convoluted vasa efferentia. This portion is known as the globus major, or head of the epididymis. The coni vasculosi finally all empty into one canal—the canal of the epididymis, which forms by its convolutions the central part or body of the epididymis. This body is separated from the testicle proper by the *cul-de-sac* of the tunica vaginalis already alluded to. Below, the canal of the epididymis exhibits further convolutions. At this point it is known as the globus minor, or the tail of the epididymis. Connective tissue unites it to the testicle at this point, and from here on the canal becomes more dense, and is known as the vas deferens.

The little supernumerary diverticulum (or there may be several), known as the vasculum aberrans of Haller, when present, usually empties into the canal of the epididymis at this point. The canal of the epididymis is furnished with ciliated epithelium, whose cilia sweep its contents along toward the vas deferens.

The two constituent parts of the testicle, which have been briefly described above, are developed separately in the fœtus. Each receives its blood in the main from a separate artery, although these arteries anastomose pretty freely at their extremities. This peculiarity of vascular supply may account for the fact that one portion of the organ is often diseased the other part remaining sound. The epididymis is formed from the lower part of the Wolffian body, and its duct is a continuation of the Wolffian duct to the lower and back part of the bladder. The deferential artery, a branch of the hypogastric, supplies it. The secreting portion of the testicle, on the other hand, is formed from fœtal tissue lying in front of, but seemingly independent of, the Wolffian body, and its artery, the spermatic, comes from the aorta just below the renal artery (Kölliker).[2]

ANOMALIES OF THE TESTIS.

Instances of supernumerary testicles have been reported, but in all the cases where dissection has been resorted to, to clear up the doubt, the extra organ has proved to be some cystic, fatty, fibrous, or other tumor, so that it is doubtful if the anomaly exists at all. Even in the two cases of double penis (p. 4) there was no abnormality of the testicles. The opposite condition, however—absence of the testicle—does exist (Paget).[1] One or both testicles may be absent; the vas deferens and seminal vesicle in these cases being sometimes fully developed, and traceable into the inguinal canal, or even to the bottom of the scrotum (Curling).

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[1] Curling, *op. cit.* [2] Entwickelungs-Geschichte des Menschen und der höheren Thiere."

CRYPTORCHIDISM—MONORCHIDISM.[2]

A CRYPTORCHID (*κρύπτειν, to conceal; ὄρχις, testicle*) is an individual whose scrotum contains no testicles.

A MONORCHID (*μόνος, alone; ὄρχις, testicle*) has only one testicle in the scrotum.

When a testicle is absent from the scrotum, the presumption is that it has been arrested somewhere in its descent. The testicle is formed high up in the abdominal cavity, behind the peritonæum, in about the position occupied by the lower end of the kidney at birth. During fœtal life, guided by the gubernaculum testis, it descends, carrying with it a portion of peritonæum, which is to become the tunica vaginalis. It passes through the inguinal canal, and by the end of the ninth month is usually in the scrotum. It may, however, be arrested at any point in its descent, or may follow an abnormal direction, finding its way into the thigh through the femoral ring, or even into the perinæum, where it may become inflamed, and has been mistaken for an abscess. One very common point of detention is in the inguinal canal. In all of these situations it can be felt, and should be searched for in case the scrotum is empty. In about one case in five (or ten—Wrisberg) the testicle is not in the scrotum at birth. It descends, usually, during the first week, but is often retained for months, sometimes longer, and not very infrequently until puberty, or even later; it has been known to descend as late as thirty years after birth. When it descends after birth there is great probability that a portion of intestine will follow it, constituting congenital hernia. It is estimated that in about one case in a thousand the testicle is permanently retained in the abdomen, or inguinal canal. The right testicle is a little more liable to this accident than the left (Petréquin Quetelet).

When the testicle is retained in an abnormal position, it is almost universally found undeveloped, or in a state of fatty or fibrous degeneration. Under these circumstances no spermatozoa are discovered in it, or in the seminal vesicle of the affected side. Exceptionally, however, it has been found of full size. When one testicle only is retained, the other undergoes conservative hypertrophy, and the deformity is a matter of no consequence, as one large, healthy testicle is all-sufficient. But, where both testicles are retained, it may become a very nice matter in a medico-legal sense, or in regard to prospective matrimony, to decide whether the cryptorchid is sterile or not. According to Godard, the cryptorchid is necessarily sterile, yet he may be, and usually is, thoroughly potent, and possessed of the full amount of sexual desire. An opinion of his ability to beget children can only be founded upon microscopic examination of the spermatic fluid. The secretion may be natural in consistence, quantity, and odor (it is liable to be brownish), but, if it does not contain spermatozoa, impregnation cannot be effected. The least offensive way of obtaining a specimen for examination is to request the patient, immediately after sexual congress, to cause the woman with whom he has cohabited to urinate, and then to bring the urine for examination. When allowed to settle for a short time, spermatozoa can always be recovered, with a pipette, from such a specimen, provided the seminal fluid contained any. Several cases are recorded where cryptorchids have married, whose wives have had children, but doubt has always been raised as to the paternity of the offspring. Authors are not of accord as to the sterility or virility of cryptorchids. The majority take the former ground, but, as these individuals are apparently never impotent, the test of their sterility can be easily applied, if desirable.

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[1] *Medical Gazette*, vol. xxix., p. 817.

[2] The literature on this subject is rich. The following papers may be consulted with profit:

Follin, "Mém. sur les Anomalies de Position du Testicule," Archiv. de Méd., 1851.

Le Comte, "Thèse sur les Ectopies congénitales des Testicules," 1851.

Roubaud, "Traité de l'Impuissance," Paris, 1872, p. 607.

Godard, "Études sur l'Absence congéniale du Testicule," Mém. de la Société de Biologie, 1856–'59.

Godard, "Étude sur la Monorchidie et la Cryptorchidie chez l'Homme," Paris, 1857.

Godard, "Études sur l'Absence congeniale du Testicule," 1858.

The retained testicle is apt to become diseased. When retained in the inguinal canal, it is often the seat of severe pain, especially at about the age of puberty, from pressure by the tendons of the abdominal muscles. It may be painful enough to impede motion, in which case an operation should be undertaken for its removal. A testicle in this situation is liable to become the seat of malignant disease, due partly, according to Virchow,[1] to the injuries inflicted upon it by the contractions of the abdominal muscles, and partly to a predisposition from its incomplete development. A testicle in this situation, which becomes inflamed, as it may in connection with gonorrhœa, is not able to swell, and consequently is doubly painful. Testicles retained in the inguinal canal may be mistaken for hernia.

Operations to replace a testicle when found in an abnormal position have been undertaken, but without much success. If it can be felt, it is always worth while to make an effort to get it into the scrotum, to insure its development, to guard against future disease, and to allow a truss to be worn above to close the inguinal canal, and prevent the possibility of hernia. In two (personal) unpublished cases this was effected by careful manipulation extending over a length of time. If the testicle cannot be brought into its place, it may be left alone, unless it become painful or diseased. The pad of a truss should not be placed upon it.

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[1] "Die krankhaften Geschwülste."

Occasionally monorchidism is acquired. One case has been reported[1] where the right testicle was suddenly and violently drawn up into the inguinal canal during masturbation, and did not come down again. Later in life, when the patient died, this testicle was found soft, atrophied, pulpy, about one-fifth the size of its fellow.

HYPERTROPHY AND ATROPHY.

The testicle becomes hypertrophied conservatively when its fellow is defective, or wanting, and in certain lusty individuals the testicles are abnormally large.

Atrophy of the organ may result from a variety of conditions. The retained testicle in a monorchid does not develop fully, and may atrophy. In hot climates the organ is said to atrophy (Larrey), as it does normally in old age. Atrophy may come on, usually attended by neuralgia, after prolonged sexual excesses, or may succeed sudden pain after fatigue. Probably some inflammatory element is at the bottom of this cause.

True orchitis, or the form complicating mumps, is liable to be followed by atrophy. Any tumor or morbid growth pressing on the testicle, or obstructing its vascular supply, may cause atrophy, e. g., ligation of spermatic artery, aneurism of aorta involving the spermatic arteries (Wardrop's case); in certain rare cases, hydrocele, large congenital herniæ, varicocele, may act in this way. A section of the nerves of the testicle will cause atrophy, as may also certain injuries of the head, back, or spinal cord. Ligation of all the veins of the cord produces atrophy. Atrophy sometimes attends severe neuralgia, especially the form accompanying large varicocele. Non-use of the testicle for any length of time does not cause it to atrophy. The somewhat common belief that the long-continued use of iodine will occasion atrophy of the healthy testicle is incorrect. Occasionally in children the testicles will cease to develop, or even atrophy, without any apparent cause. Syphilis may occasion atrophy, without any gummy deposit.

Treatment.—For atrophy of the testicle there can be but little done. The causes are usually beyond the surgeon's control. In certain cases the cause (neighboring tumor, syphilis) may be removed.

CONTUSIONS OF THE TESTICLE.

Contusions of the testicle are rare, owing to the peculiar anatomical surroundings of the organ, notwithstanding its exposed position. In severe contusions there is usually more or less ecchymosis, and perhaps hæmatocele, or orchitis, and subsequent atrophy may result. One of the modes formerly adopted in the East for emasculating the attendants of the harem was that of squeezing the testis, and a similar plan has been resorted to upon animals instead of castration, in England and France (Curling). The inflammation after injury may be sufficiently severe to lead to the formation of abscess or to gangrene.

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[1] *Medical Times and Gazette*, vol. xviii., p. 67.

Treatment.—The patient must be placed at once upon his back, if the contusion be severe, with the testicle elevated and covered with a cooling application; if subsequent inflammation occur, it must be met appropriately (orchitis).

WOUNDS OF TESTICLE.

Punctured wounds, if small, are of no importance. They give rise to no inconvenience and heal without trouble. Penetrating wounds of any size, however, allow some of the tubular structure of the testis to escape. This, projecting outside and covered with pus, is very apt to be mistaken for a core of pus, and to be pulled out as such. Malgaigne mentions a case where he saw the whole pulp of the organ pulled out in this way. Incised wounds are followed by suppuration, partial exulceration, and recovery, with more or less atrophy. Injuries to the testicle (contusions or wounds) are usually very painful in sensitive subjects, and are liable to be complicated at the time with faintness, nausea, vomiting, convulsions, or tonic spasms.

Treatment.—In wounds of the testicle, if there be any true hernia of the secreting substance, it should be reduced if possible, and retained by pressure, or by a suture through the tunica albuginea. If it cannot be reduced, it may be snipped off with the scissors, or allowed to separate by the natural inflammatory process, but should in no case be pulled upon. Large incisions should be cleaned, united by suture, and the parts carefully supported. Even if a large part of the testicle has been destroyed by the accident, an effort should be made to preserve what is left. Dorsal decubitus must be preserved, and the testicle properly supported. Cool water-dressing is as good as any that can be employed, perhaps mingled with a little alcohol or carbolic acid.

HÆMATOCELE.

The term hæmatocele is applied to a tumor caused by the effusion of blood into the sheath of the testicle and cord (sometimes into the cellular tissue of the scrotum as well), into the tunica vaginalis, or into a preëxisting cyst of the cord. It is usually of traumatic origin, or is a secondary affection occurring where hydrocele has preceded it by a mingling of blood with the serous contents of the tumor.

The most common cause is violence, associated with crushing of tissue and injury of blood-vessels. An operation upon a hydrocele may wound a vessel, or the testicle itself, and, if the hæmorrhage takes place internally, an hæmatocele results. The disease may exceptionally have a spontaneous origin from active or passive hyperæmia; varicose scrotal or seminal veins connected with great laxity of the scrotum; or, rarely, from a hæmorrhagic secretion in scorbutic individuals. Sir Benjamin Brodie[1] mentions as a cause a diseased (calcareous) condition of the arteries distributed upon the tunica albuginea, similar to the degeneration of the arteries of the brain, which often precedes apoplexy. One of them may rupture into the tunica vaginalis.

There are, consequently, two varieties. The one coming on rapidly, usually after injury, and attended by effusion of blood into the scrotum, where the latter suddenly swells, becomes blue, black, or violet-colored, with a more or less evident feeling of fluctuation, or where a preëxisting cyst or hydrocele, after violence, becomes suddenly larger, more tense, and painful. There is more or less high symptomatic fever, and the inflammation may possibly go on to suppuration.

In the other, or spontaneous variety, the tumor increases slowly in size and simulates hydrocele, except in regard to translucency. This latter form is difficult to diagnose from hydrocele in proportion as the blood is thin, and confined to the tunica vaginalis propria.

The blood in hæmatocele may be found red and fluid, but it is usually black or brown, and may be mixed with pus, if severe inflammation has followed its effusion. Its fibrinous portions may be more or less stratified, as in aneurism. The walls of the tunica vaginalis, or of a cyst in contact with blood (unlike what occurs when their contents are serous) tend to thicken and become adherent to the surrounding connective tissue, while the inner surface becomes rough and uneven, resembling any thing more than a serous surface (Fig. 126). The walls of hæmatocele have been found an inch thick.

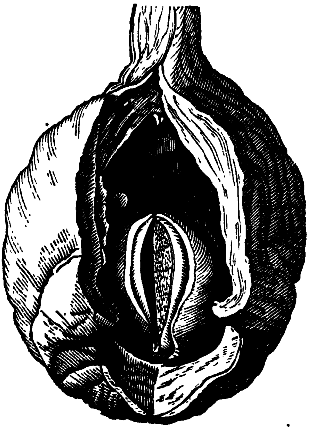

FIG. 126.—(*Curling.*)

The diagnosis of hæmatocele of the second or spontaneous variety presents many difficulties. Here there is no guide in any discoloration of the scrotum, or any suddenness of growth of the tumor. The records of surgery possess many cases where perfectly healthy testes, surrounded by an hæmatocele inside of a thickened tunica vaginalis, have been extirpated, under the idea that they were cancerous. Often, there exists no positive means of diagnosis short of an exploratory operation with the knife, which is the proper course to follow in such cases. There are, however, characteristics of hæmatocele which may serve to distinguish it from hydrocele and malignant growths.

The pyriform shape of hydrocele exists, but there is no translucency of the tumor. This, however, would also be the case in an old hydrocele, with thickened walls. The mass feels unusually heavy when balanced in the hand. If it has been attentively watched, it will be found to have decreased a little in size at some period of its growth, which does not occur in malignant disease. The peculiar sensibility produced by pressure on the testicle can often be called out by pressing upon the mass behind, at about the middle portion. Exploration with an exploring-needle will, perhaps, give a negative result, but, with a trocar, the diagnosis may often be cleared up. The amount of pain is variable. The general health does not, as a rule, suffer much. In a doubtful case an exploratory incision is demanded.

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[1] *London Medical Gazette*, vol. ix., p. 927.

In the traumatic variety, when the blood has been effused into the connective tissue of the scrotum, the diagnosis is made at once, by the history, size, heat, and color of the tumor. This is more strictly contusion, with effusion of blood, and not true hæmatocele; but it may accompany the latter condition when due to violence.

Treatment.—In acute cases all that can be done is to keep the patient upon his back, with the testicle supported and covered with cold lotions, administering perhaps an occasional laxative and an anodyne if the pain be severe. If the quantity of blood effused is not too great, the pain will soon begin to subside, and the patient may be allowed to go about with a suspensory bandage. The blood will gradually be absorbed.

If, in spite of these means, *which will rarely be found to fail*, blood continues to be poured out into the cavity so that the pain becomes excessive, and the tension of the parts very great, a trocar may be introduced to draw off the blood, and cold and pressure applied to prevent refilling of the sac. If it fill again, a second tapping, delayed as long as possible, will probably afford a more serous fluid than the first, and a third, a fluid still less tinged, after which iodine may be injected. (*See* TREATMENT OF HYDROCELE.) When, however, the blood is in clots, it will not flow through a trocar, and then an incision may be required, as it is also when the inflammation is imminent from tension. All the clots should be turned out, the cavity thoroughly washed with a mild, warm solution of carbolic acid, one-half of one per cent.; bleeding-points should be looked for and secured by ligature. The dressing consists of a little lint, position, and cool (or warm) applications, whichever give more comfort to the patient. The cavity will heal slowly by granulations.

In incising the tunica vaginalis an opening should first be made above and in front, and this should be continued on a director, or between two fingers, fairly to the bottom of the sac, to secure good drainage. If the incision be made at one stroke, the testicle, which is sometimes misplaced, and lies in front, may be laid open, an accident which has happened in the most experienced hands. If the tunica vaginalis in an old case be found much thickened, it is better to cut it away—invariably if its walls contain calcareous plates.

The reaction following operation is rapid and severe, and, in the case of old patients, it may sometimes be preferable to perform castration, as the milder alternative. With the young and middle-aged, however, this course is not to be thought of, as the testicle is seldom injured, although in long-standing cases it is occasionally atrophied. Erysipelas or gangrene may follow the laying open of hæmatocele. An hæmatocele produced by the effusion of blood into a preëxisting hydrocele may usually be treated like uncomplicated hydrocele. Any systemic state predisposing to hæmorrhage requires special management, and all operative interference should be delayed until such blood-dyscrasiæ have been removed.

HÆMATOCELE OF THE CORD.

Pott has described a diffused hæmatocele of the cord coming on during straining at lifting, or at stool, and confined within the tunica vaginalis communis. This form is exceedingly rare. It may occur, also, in connection with general ecchymosis of the scrotum from injury, and calls for the same treatment. The blood will be reabsorbed in time. It has been confounded with hernia, and operated on as such. If the tumor continue to enlarge in spite of position, rest, and cooling applications, a free incision should be made, the clots turned out, the wound washed, and the bleeding vessel sought for and secured.

When an encysted hydrocele of the cord, by accident or dyscrasial disease, becomes an hæmatocele, the same changes take place in the walls of the sac and surrounding tissue as have been described in hæmatocele of the tunica vaginalis. The treatment is also the same, care being always taken to treat the dyscrasial causative condition.

FREE BODIES IN THE TUNICA VAGINALIS.

Occasionally little excrescences spring up from the surface of the testicle within the cavity of the tunica vaginalis. They may grow anywhere within the tunica vaginalis, but are more common on the epdidymis or around the so-called hydatid of Morgagni. These excrescences have an inherent tendency to grow large at the summit by a deposition of concentric layers of very dense connective tissue, and thus become pediculated. New excrescences may form upon an old one constituting a sort of dentritic vegetation. There is a tendency to a central deposit of calcareous salts early in the formation of these little pediculated balls, which causes an arrest in their growth. After this the pedicle becomes more and more thin, and finally breaks and disappears in some motion given to the testicle. In this way are the free bodies formed. They are found of all sizes, from the head of a pin to a large hazel-nut. They are not encountered in connection with very large hydroceles, although some fluid in the tunica vaginalis usually accompanies them. They may often be felt from the outside, and be liberated at once by an incision if they cause pain or inconvenience; which, however, they seldom do. Occasionally after tapping a hydrocele great pain has been complained of, which has been found to be connected with the existence of a loose body in the sac. In structure these bodies consist of concentric layers of very dense fibrous tissue, cartilaginous to the feel, surrounding a central nucleus of calcareous matter. An attentive inspection of the surface of the testicle will often show prominences or depressions corresponding to the points where the free bodies had been attached by their pedicles.

CHAPTER XXIII.

DISEASES OF THE TESTICLE.

Hydrocele, acute, chronic.—Diagnostic Table of Chronic Hydrocele with Incarcerated Hernia.—Palliative Treatment.—Radical Treatment.—Congenital Hydrocele.—Diagnostic Table of Congenital Hydrocele and Hernial Tumor.—True and Spurious Hydrocele of Hernial Sac.—Encysted Hydrocele of Testis.—Spermatocele.—Spermatic Congestion.—Origin of Spermatocele.—Hydrocele of Cord, diffuse, encysted.

HYDROCELE,[1] or dropsy of the testicle, consists in an accumulation of serous fluid within the cavity of the tunica vaginalis (simple hydrocele), or within a cyst connected with the testicle (encysted hydrocele). This fluid is usually highly albuminous and of a pale-yellow color, but it may vary through shades of red, brown, green, and black, by the admixture of more or less blood, or blood-pigment, and in old cases the fluid may contain fatty matter and plates of cholesterine, granular bodies, pus, epithelium, and occasionally spermatozoa (spermatic hydrocele). The fluid differs, both in its nature and mode of production, from that of general anasarca. In anasarca the scrotum may be full and the tunica vaginalis empty. The liquid of hydrocele often contains a substance similar to fibrine. On exposure to the air under these circumstances, it will generally deposit in one or several layers. Buchanan, of Glasgow, found that if blood were mingled with the fluid it coagulated, when by contact of air alone it would not do so. Alexander Schmidt produced the same coagulation by adding blood-globules or hæmato-crystalline. The fluid sometimes contains salts and albuminates in a proportion analogous to that of lymph—which never obtains in the fluids of simple dropsies (Virchow).[2]

Causes.—In the aged, anæmic, weak, and badly-nourished, there may be a chronic dropsy of the tunica vaginalis, whose cause is simply general hydræmia; there are usually other serous effusions existing at the same time. This condition is a general one, and no special attention need be paid to the hydrocele, except the wearing of a suspensory bandage, until the general health is restored, after which it would be proper to undertake a radical cure, if the hydrocele did not spontaneously subside. In exceptional cases when the collection of fluid becomes excessive, palliative puncture may be resorted to. A slight amount of hydrocele exists, as a rule, in conjunction with all diseases of the testicle, especially of the inflammatory sort (orchitis, epididymitis), and not infrequently with syphilitic and tubercular disease of the organ. But in these cases again the hydrocele is only a symptom, and a radical cure should not be attempted. When the disease of the testicle subsides, the hydrocele will get well.

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[1] All forms of hydrocele, including those of the cord, will be considered in this chapter, since they appropriately fall together.

[2] *Op. cit.*

True hydrocele is the result of a secretory irritation of the tunica vaginalis testis, produced usually by mechanical violence, or in sympathy with some irritation of the testicle, cord, or urethra. The mechanical violence most apt to produce it is such as is slight, irritative, and long continued; rubbing, jolting, crushing. In warm climates it is very frequent, on account of the relaxed condition of the scrotum, which exposes the testicle to injury. In Brazil one man in every ten is said to suffer from hydrocele (Hyrtl). Hydrocele may be left behind after an acute inflammation of the testis, and, in those exceptional cases where the communication of the tunica vaginalis with the peritoneal cavity has not been closed after birth,.a hydrocele is known as congenital.

ACUTE HYDROCELE.

This is an acute peripheral orchitis, coming on in connection with acute epididymitis or orchitis, and needs no detailed account. The condition is analogous to pleurisy. The effusion is rapid, sero-plastic, or sero-hæmorrhagic. The fluid is absorbed, as a rule, while the inflammation of the testicle is subsiding, and no treatment is of any service before that time, unless, possibly, puncture, if the effusion be very large.

It is always caused in a mild degree by the stimulating injections, or other treatment used for the cure of chronic hydrocele, and may occur idiopathically without necessary connection with other inflammatory disease of the testicle, but this is exceedingly rare. Rest with cooling lotions, and acupuncture, if necessary, constitute the treatment.

CHRONIC HYDROCELE.

In chronic hydrocele, the effusion takes place slowly, and without pain. The swelling is often only discovered by accident. It commences in the lower part of the testicle in front. It has no tendency to spontaneous subsidence. The accumulation of fluid tends to go on indefinitely, with occasional periods of quiet, until, in some cases, an enormous size is reached. The amount of fluid may be only a few drachms. It seldom exceeds a pint. Curling[1] met with one case which contained forty-eight ounces. Sixty-four ounces were taken from one (personal) case. Mr. Cline is said to have removed as much as six quarts from the historian Gibbon (Sir Astley Cooper). Out of a thousand cases reported by Dr. Dujat, from the Hospital of Calcutta, in eighteen, the quantity drawn off varied from fifty to one hundred and twenty ounces for each case. The mechanical inconvenience of such a tumor in such a position is at once apparent.

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[1] "On the Testis."

When a hydrocele has lasted for a length of time, its walls are liable to a fibrous thickening, which greatly obscures the diagnosis, or they may undergo cartilaginous, or, more rarely, calcareous degeneration. If subjected to irritation, or repeated injury, which can hardly be avoided, these changes are all the more apt to occur. The contents of hydrocele may be mixed with blood, or even become purulent. Secondary cysts may form in or upon the surface of the testicle, surrounded by the fluid of the hydrocele, but this is rare. Long-continued pressure of the fluid, especially when the tunic is thickened and covered with lymph, occasionally, but very rarely, leads to atrophy of the testicle. Points of adherence may exist between the two surfaces of the tunica vaginalis, dividing the cavity into compartments.

Symptoms.—Hydrocele is usually pear-shaped, larger below than above; or it may be oval, and, if very large, almost spherical. It cannot be reduced by pressure. Fluctuation can usually be made out. The tumor is generally very tense, the scrotum often stretched and shining. The cord, of natural size and feel, can be grasped above the tumor. The weight is slight compared with the size of the mass. The testicle is usually situated behind, a little below the centre (Fig. 127), and pressure on this point gives rise to the peculiar sensation experienced when the testicle is squeezed. Occasionally the testicle is found below and in front, more rarely in the centre, in front, from plastic adhesion. Its position should always be ascertained before operating on a hydrocele. Dupuytren mentions several cases where this precaution was overlooked, the testicle was wounded and the diagnosis unconfirmed. If the testicle be punctured, as a rule no serious inflammation results. Pressure on a hydrocele does not produce pain; there is no heat or redness of the skin, unless the tumor be large enough to keep it constantly on the stretch. There is flatness on percussion, differing from hernia, and there is no subjective symptom ex-

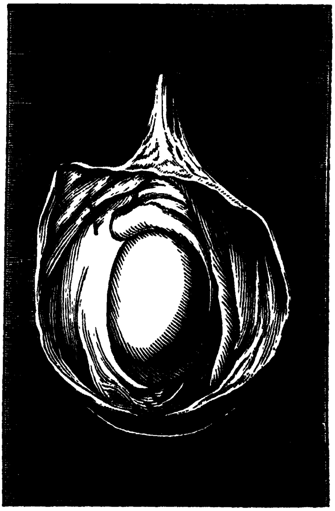

FIG. 127.—(*Pott.*)

cept a little dragging sensation in the groin and lower part of the abdomen, running up to the back, caused by the weight of the tumor.

Diagnosis.—The infallible diagnostic sign is translucency. This is obtained by making the skin tense over the tumor, and viewing a lighted candle, held as near the tumor as possible, through the upper part of the swelling, shading the eye with the hand, or, better still, looking through a cylindrical roll of paper, or a stethoscope. If the room be darkened, translucency may be detected where otherwise the test might fail. Often translucency may be made out by simply making the tumor tense with one hand, shading the eye with the other, and holding the hydrocele between the eye and the window, in the daytime. Translucency is greater in proportion to the slowness of the accumulation, the thinness and whiteness of the walls, and the limpidity of the fluid. If the contents of the tumor are dark-colored, or its walls very dense and thick, there will be no translucency.

In such a case exploratory puncture will decide on the nature of the tumor. A fine exploring trocar should be used, and not an exploring needle, as the fluid will not always run when the latter is used, if the walls of the sac are dense and elastic. Few diseases are easier of detection than simple, uncomplicated hydrocele; few more difficult where many complications exist. Varicocele may complicate hydrocele.

To recapitulate—the symptoms of simple hydrocele are pyriform shape, slow growth, commencing at the bottom of the scrotum, fluctuation, translucency—all with absence of pain.

DIAGNOSTIC TABLE—HYDROCELE—INCARCERATED HERNIA.

Hydrocele.	*Incarcerated Hernia.*
1. Largest below.	1. Largest above.
2. Commences gradually.	2. Comes on suddenly.
3. Commences at the bottom of the scrotum, and grows up.	3. Commences at the external ring and grows down.
4. Is tense or fluctuating.	4. Usually doughy.
5. Cord can be made out (normal) above tumor.	5. Cord cannot be distinguished, or is felt as distinct from tumor.
6. Testicle cannot be found.	6. Testicle can usually be separated from tumor posteriorly.
7. Dullness on percussion.	7. Resonance on percussion (unless hernia be omental).
8. Tumor heavy, but movable.	8. Tumor unwieldy.
9. Reduction impossible.	9. Reduction impossible.
10. Size usually constant.	10. Size varies at short intervals.

Simple hydrocele may be complicated with incarcerated or simple hernia (Fig. 128). For true or false hydrocele of a hernial sac, and congenital hernia with hydrocele, *see* p. 405, *et seq.* Absence of pain makes diagnosis easy, with all inflammatory diseases. Smoothness of surface distinguishes it from cancer, cystic or tubercular disease, and translucency from syphilitic disease.

Treatment of Simple Hydrocele.—Hydrocele is cured by causing the fluid to be reabsorbed, or by exciting an inflammation within the sac leading to adhesion of the walls and obliteration of the cavity. Absorption occurs occasionally in the young, and, as a rule, in acute hydrocele spontaneously. The treatment is palliative or radical.

Palliative treatment consists of *tapping* and *acupuncture.*

Tapping.—First be satisfied of the position of the testicle. Then make the skin tense, and plunge in a well-oiled, fine trocar through the anterior part of the tumor, a little above the middle, holding the instrument with the index-finger placed firmly upon the canula at that point up to which it is desired to make it penetrate; introducing it in a direction upward and outward, to avoid the testicle. The canula should fit tightly, else the tunica vaginalis may be pushed before its shoulder. A knowledge of the position of the testicle insures the operator from injuring it. In withdrawing the trocar, push the canula a little farther into the cavity of the sac, and be sure that it is there by freely moving its extremity in every direction. If the end of the canula touch the testicle or cyst-wall, there will be no flow of fluid.

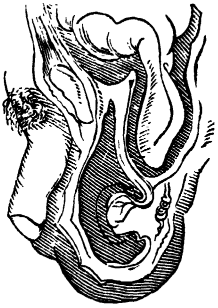

FIG. 128.—(*Maclise.*)

This simple operation will always efface the tumor at once, but in the majority of instances the sac will begin to refill in a few days, and after some weeks, or at most months, will have regained its previous size. Sometimes the tumor never refills, and the palliative operation thus becomes radical. This rarely occurs except with children, and very recent hydroceles. The chances of obtaining this fortunate result are greatly increased if the inside of the sac be roughly scratched with the point of the exploring-needle or the trocar, after the fluid has been drawn off. If the patient is old, or greatly debilitated, he should always rest for a few days after tapping. The constant stretching of the skin by a large hydrocele renders it prone to take on gangrenous inflammation. Sir Astley Cooper mentions two cases of inflammation with sloughing, followed by death, in old men who took a long walk immediately after the operation. It is well also if the collection of fluid is very large, especially if the patient is old, not to draw it all off at one sitting.

If the testicle has been wounded, the patient will complain of great pain, and blood will flow after the serum has been evacuated. Under these circumstances it is advisable to strap the testicle with adhesive plaster, immediately after the operation, to prevent the further effusion of blood into the sac, as this is favored by the removal of pressure. The pressure by strapping is said to favor adhesion of the surfaces of the tunica vaginalis. Collodion is recommended by some authors to compress the testicle in this and other conditions, but it will not do for all cases, as its application to the thin and sensitive integument of the scrotum sometimes gives rise to exquisite and prolonged torture.

Acupuncture.—This consists in making the skin tense over the tumor, and penetrating the sac rapidly a number of times with a needle, which should be rotated as it is being withdrawn. The serum, in cases so operated upon, gradually escapes into the scrotum (in twenty-four to forty-eight hours), where it does no harm, and whence it is absorbed.

The adult hydrocele will usually fill up after this operation, as it will after tapping, but the hydroceles of children often remain radically cured, especially if the internal surface of the sac be scratched. If the cyst-wall be thick, and the tumor not translucent, neither tapping nor acupuncture will ever effect a cure. Healthy young patients can put on a suspensory bandage, and resume work at once, after tapping or acupuncture.

Radical Treatment.—External irritation or stimulation of the skin will often suffice to cure a simple hydrocele in a young child. Tincture of iodine, at about half strength, may be used, or a lotion, recommended by Curling, of hydrochlorate of ammonia ℥j, distilled vinegar ℥iv, water ℥vj; in fact, any mildly stimulating ointment or lotion will do. It is a waste of time to try this treatment upon the adult.

Although chronic hydrocele has been known to subside spontaneously in the adult, yet this termination is of so rare occurrence that practically it may be said never to happen. Sometimes the sac becomes ruptured by accident, inflammation follows, and the cure is permanent. That this is not an inevitable result is proved by a case reported by M. Serres,[1] of a Spaniard, who was accustomed to ride horseback, or perform some other violent exercise, when his hydrocele became uncomfortably large. In this way he had ruptured it thirty times, remaining well for a considerable period after each application of this rather severe treatment. Of the many methods of treating simple hydrocele, only two need be detailed, as they are applicable to all cases, namely, injection and incision, including excision of the tunica vaginalis. A small seton may sometimes be permitted in the case of a child, but for the adult it ranks with tent and caustic, as too severe. Subcutaneous scarification is equivalent to puncture and simultaneous scratching of the inside of the cyst. Of late years galvano-puncture has been greatly vaunted as a radical treatment for simple hydrocele. It is but little better than simple tapping, the advantage being that the puncture made by the negative needle tends to remain patulous for some time after the needle has been withdrawn, allowing the fluid to escape, and that the irritation starting from this point is sometimes sufficient to induce enough adhesive inflammation to close the sac. The *modus operandi* is simple, and consists merely in introducing two needles at opposite points into the tumor, and passing a mild galvanic current, without causing too much pain, for about half an hour, being sure that the points of the needles do not come into contact with each other, or with the testicle. The number of cells used is regulated by the sensations of the patient. No after-treatment is required.[1]

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[1] Quoted by Curling, *op. cit*

Injection.—All simple hydroceles which are translucent, no matter what their age or how great their size, are amenable to treatment and cure by injection. Injection is not applicable to cases where the contents of the tumor are sero-purulent or sero-sanguinolent, or where the tunica vaginalis is extensively thickened, with or without calcareous deposit (*see* Case XXIX.); under these circumstances adhesion cannot be excited by injection; suppuration is more apt to occur, and incision or excision should be resorted to. Hydrocele with syphilitic testis should not be injected. The following type case will illustrate the point:

CASE XXVIII.—A middle-aged, apparently healthy man, presented himself for treatment of a moderately-sized hydrocele. The fluid had already been drawn off by a surgeon, and the cavity injected with iodine. The result had been purely negative. After the hydrocele had been tapped and the fluid evacuated, the testicle was found to be a little over-sized, hard, smooth, and to possess the general characteristics of a syphilitic testis. Further questions made out a syphilitic history. Consequently, no injection was made, but the sac was allowed to refill. A few months of anti-syphilitic treatment cured the hydrocele, as well as the disease of the testicle giving rise to it.

Celsus alluded to injections as a method of treating hydrocele, but Munro, of Scotland, Sir James Earle, and Sir James Ranald Martin, of England, are the names most prominently connected with it. Inflation with air has been employed, and the most varied substances have been used in injections, from distilled water to the strongest acids, hot and cold. Many substances have been employed successfully, such as spirits of wine, port wine, solutions of alum or sulphate of zinc, air, chlorine gas, lime-water (which Curling strongly recommends); but, better than all these, is the tincture of iodine, introduced by Martin. This is stimulating enough without being too irritating, and usually causes no harm if some of it escape into the connective tissue of the scrotum—an advantage which most other injections do not possess. If a mild injection be required, the compound tincture may be employed, diluted one-half with water, otherwise the pure compound tincture should be used.

A hydrocele should never be injected when first seen. Tapping should be tried first, and perhaps the fluid will never reaccumulate. When the tumor contains more than ten or twelve ounces of fluid, injection ought not to be practised until its size has been reduced by repeated tappings, assisted by pressure to lessen the extent of the secreting surface. If this cannot be effected, the patient will be wise to submit to frequent tapping, and give up the idea of radical cure, for there is danger in exciting a very extensive serous surface to inflame, and it is not justifiable to perform an operation which may compromise life for a disease which is perfectly benign. If the hydrocele is found to contain more or less blood, injection should be postponed until some future tapping yields a comparatively limpid fluid. If syphilitic or tubercular disease be found, injection is inadmissible.

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[1] To test this method, I selected two cases in young healthy subjects, one of spermatocele, the other of simple hydrocele. The testicle was perfectly healthy in both cases, and the wall of the hydrocele very thin. Stöhrer's battery was used, and as strong a current passed as the patients could bear—in the one case sixteen, in the other, eight cells. The current was passed for nearly three-quarters of an hour in each case. In one, a slight, cutaneous slough appeared at the point of entrance of the negative pole. The result in both cases was entirely negative. The tumor subsided to a great extent in a few hours, but refilled rapidly, no permanent benefit ensuing.—KEYES.

To inject the tunica vaginalis, proceed as follows: Puncture with a trocar of suitable size. Be sure, by moving the end of the canula, that the instrument has penetrated well within the cavity. Allow all the fluid to run off. Examine the testicle thoroughly. If it be much larger and harder than natural, or in any way sensibly diseased, do not inject. Some hardening and thickening of the epididymis alone does not contraindicate injection. The amount of tincture of iodine thrown in should equal about one-half the quantity of fluid drawn off. It should be thrown in gradually, retained several minutes, and worked around in such a way that every portion of the inner wall of the sac may come into contact with it. The fluid is then allowed to run off, and the canula withdrawn. Great pain, with nausea and sickness, is often experienced while the injection is within the sac. The pain may continue for several hours, extending to the abdomen and thighs. Occasionally no pain is felt. The pulse sometimes falls, and there are evidences of shock. The amount of pain experienced is no criterion of success, but rather the reverse. Care should be exercised not to throw in any air with the injection, as this would prevent contact of the fluid with the walls of the sac. The more concentrated the solution, the more plastic is the inflammation which follows. A healthy man may walk about until pain compels him to keep quiet; weak or feeble patients should remain in bed for twenty-four hours after the operation. At the end of this time the testicle will commence to get large and hard, the scrotum becomes œdematous, and there will be more or less reaccumulation of fluid. The patient will often consider himself more hurt than benefited by the operation at first. If the inflammatory reaction is not very painful, the patient may go about with a suspensory bandage; if it should not come on at all, or is very slight, the testicle should be squeezed and manipulated daily for a week or ten days, so as to increase the grade of inflammation. If, on the contrary, severe inflammatory reaction sets in, the patient should be confined to bed with the testicle supported, perhaps poulticed. After four or five days, or sooner, the pain and swelling begin to subside, the fluid is absorbed, a harsh friction-sound can be produced by rubbing together the two folds of the tunica vaginalis, and a permanent cure is effected in from three to six weeks or longer. A second operation is rarely necessary. In double hydrocele both sides should not be injected at the same sitting. In using solutions of iodine, metallic instruments should be dipped in oil before use, and in a solution of potash afterward, or they will soon corrode. If the quantity of fluid which reaccumulates after operation be very great, keeping the surfaces covered with the plastic exudation too far apart, Lisfranc advises that it should be drawn off with a fine trocar, as in the operation of simple tapping.

Incision must be employed where there exists the least doubt as to whether or not the tumor be hernia, where the walls of the tumor are very thick or calcareous, where its contents are sero-purulent or sero-sanguinolent, and where injection has failed. Unless the position of the testicle has been positively made out beforehand, the sac should be opened upon a director, otherwise a clean incision may be made from top to bottom anteriorly. If the walls of the sac are very thick, and especially if they contain calcareous plates, they should be cut away. A type case of the sort is the following:

CASE XXIX.—A healthy man of advanced middle age applied for treatment of hydrocele. The fluid drawn by exploratory puncture was pellucid. Enough study was not bestowed upon the testicle afterward, and an injection of iodine was practised. Nothing peculiar occurred until the fourth or fifth day, when inflammation of a bad sort came on, attended by high fever and depression. The scrotum became purple, the testicle large, hard, and tender. This excessive inflammatory reaction, with general depression, was met at once by laying open the tunica vaginalis from top to bottom. Now, upon introducing the finger through the wound, the sharp edges and spiculæ of the calcareous plates could be distinctly felt. The parts were dressed with warm water, and allowed to digest for several days, after which, when the general condition had improved, the thickened calcified walls of the tunica vaginalis were cut away, and a cure followed, without other bad symptoms.

The wound is to be dressed loosely with lint or oakum, and the patient kept in bed with the testicle supported. Suppuration will be established by the fourth or fifth day, when the dressing should be removed by syringing with warm water, and reapplied daily. The wound now becomes a simple granulating cavity, and is to be treated as such. The patient is confined to bed from two to eight weeks. Incision is the most ancient of all the methods of treating hydrocele. It is too severe an operation for general application, and should not be resorted to except to meet the conditions above enumerated.

CONGENITAL HYDROCELE.

In congenital hydrocele there has been only a partial obliteration of the peritoneal prolongation at its neck, and, instead of the usual solid, thin, fibro-cellular cord (Scarpa's habenula), we have an open canal making the cavity of the tunica vaginalis continuous with that of the peritonæum. The abdominal serum gravitates into this cavity, and hydrocele is the result.

The diagnosis is usually easy, but in certain cases there is some chance of confusion with hernia.

Congenital Hydrocele.	*Hernial Tumor.*
1. Appears soon after birth.	1. May appear at any time.
2. Tumor continues into inguinal canal.	2. Same.
3. Receives impulse on coughing.	3. Same.
4. Flatness on percussion.	4. Resonance on percussion.
5. Always reducible at an even rate, more or less rapidly according to size of opening; no jerk.	5. If reducible, goes back suddenly, with a gurgling sound.
6. Testicle, entirely obscured by the tumor, reappears on reduction of the latter.	6. Testicle can usually be made out as a distinct lump.
7. Feel soft, not doughy.	7. Doughy feel—perhaps gurgling, on manipulation.
8. Always translucent.	8. Never translucent.

A simple hydrocele may coexist with hernia, at any time of life, and it is not uncommon for congenital hydrocele to be complicated by congenital hernia (Fig. 129). Congenital hydrocele may be found in adults, but is rare.

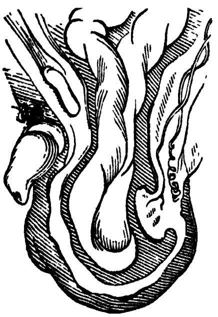

FIG. 129.—(*Maclise.*)

Treatment of Congenital Hydrocele.—The fluid need not be reduced, but a well-fitting truss must be applied. This will usually obliterate the neck of the sac, and is Nature's method of accomplishing cure. The fluid will be absorbed in from two to eight months after closure of the neck of the sac. If not absorbed, the case, after the neck is closed, may be treated as simple hydrocele. Complication with hernia does not call for any modification of treatment. Congenital hydrocele should never be injected. Desault and Dupuytren did inject congenital hydrocele with a stimulating fluid, making, at the same time, firm pressure at the ring. This treatment, sometimes successful, has also been followed by fatal peritonitis.

HYDROCELE OF HERNIAL SAC.

An old hernial sac may become obliterated at its neck by wearing a truss, or by becoming plugged up by a portion of small intestine, or a piece of omentum. This old sac may fill with fluid, and thus become hydrocele of the hernial sac.

The diagnosis is made mainly by a study of the history of the case.

Treatment.—Injection is not allowable. A careful incision is to be made, the fluid evacuated, and any portion of intestine or omentum blocking up the neck returned into the abdomen. Dress with lint.

SPURIOUS HYDROCELE OF HERNIAL SAC.

This is a considerable accumulation of fluid around an incarcerated hernia.

Treatment.—Incision and operation for reduction of hernia.

The fluid in true and in spurious hydrocele of the hernial sac is usually dark colored.

ENCYSTED HYDROCELE OF THE TESTICLE.

Simple cysts, developed out of the pediculated or non-pediculated hydatids (so called), sometimes containing spermatozoa, are found about the head of the testicle. They may be found within simple hydrocele, and it is by the bursting of one of these cysts into the cavity of an already-distended tunica vaginalis (or its puncture during operation) that the contents of hydrocele contain spermatozoa (spermatic hydrocele). On this point Virchow and Gosselin are in accord.

Such cysts may be treated by incision or injection.

SPERMATOCELE.

Spermatocele is a collection of serous fluid, containing spermatic elements, either in the tunica vaginalis or in a cyst situated near the head of the testicle.

The title has been inappropriately bestowed upon another condition, which may be briefly disposed of. When the sexual appetite has been kindled and kept excited for some time without being gratified, seminal fluid, which has been produced and is collected in the testicle, vas deferens, and seminal vesicles, will usually be discharged in an involuntary emission at night, and no inconvenience will be felt beyond slight aching, and increase of size of the testicle. Sometimes, however, Nature fails to relieve herself, and then the testicle becomes large, hot, and excessively tender, the epididymis is distended and knotty, the whole cord tender and tense, the scrotum red, the suffering very considerable, and the testicle, apparently, about to become acutely inflamed. The origin of the mischief can always be ascertained. A cure follows a natural discharge of the excess of semen, or may be brought about by rest, elevation of the testicle, and cooling lotions. This derangement does not deserve the name of spermatocele. It might be called *spermatic congestion.*

Liston (1843) and Lloyd (1849) first found spermatozoa in the fluid of hydrocele. Spermatic hydrocele does not exist, except in an encysted form, or secondary to it. Although a tumor may resemble hydrocele in all respects, yet it may yield, on puncture, a *milky fluid containing spermatozoa*. In such cases one of two accidents has occurred:

1. An encysted spermatocele, jutting out within the tunica vaginalis, and obscured by its fluid, has been punctured during tapping of the latter, and thus allowed a mingling of spermatic elements with the other contents of the hydrocele.

2. The cystic spermatocele has ruptured early in its formation, discharged its contents into the tunica vaginalis, and continued on furnishing spermatozoa mixed with the fluid of the hydrocele (Virchow, Gosselin).

There exist normally upon the head of the epididymis several little prominences,[1] solid and cystic, known as the hydatid of Morgagni or pediculated hydatid, corpus innominatum of Giraldes, and non-pediculated hydatids. They are the remains of the Wolffian body, and of the duct of Müller. From one of the non-pediculated hydatids, undoubtedly spermatocele is formed.[2]

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[1] Rosenmüller, "Quædam de ovariis Embryonum et Fœtuum humanorum," Lipsiæ, 1802. Kobelt, "Der Neben-Eierstock des Weibes," Heidelberg, 1847. Müller's "Physiology," by Baly. Virchow, "Die Krankhaften Geschwülste." Stricker, "Manual of Histology," American edition; and "Todd's Cyclopædia," vol. v., Supplement, Art. "Parovarium."

[2] The testicle is developed in the fœtus, near the Wolffian body, but independent of it. This Wolffian body consists of a set of tubes, all of which open into the duct of the Wolffian body. The duct terminates in the uro-genital canal. This duct becomes finally the vas deferens in the male (in the female it atrophies). Of the tubes forming the Wolffian body the central ones unite by open ends (vasa recta) with the testicle. They become the coni vasculosi, and connect the testicle with the canal of the epididymis. Of the lower cæcal tubes of the Wolffian body, not connecting with the testicle, some atrophy, and others (one or more) become developed into the vasa aberrantia of Haller, while the upper tubes atrophy, or become converted into non-pediculated hydatids (so called); in other words, simple little cysts at the head of the epididymis. The corpus innominatum of Giraldes, a convolution of small tubes, shut at both ends, is another remnant of the Wolffian body. In the female, all the tubes of the Wolffian body continue cæcal. They constitute the parovarium of Rosenmüller, and furnish the little cysts so often existing normally in the broad ligament, near the outer border of the ovary.

Besides the duct of the Wolffian body, there is found in the fœtus another tube, beginning in a blind extremity running over the tubes of the Wolffian body, but not connected with them or with their duct, to which it runs parallel, and emptying by a separate orifice into the uro-genital canal. This is the duct of Müller. In the female it forms the Fallopian tube. Its extremity becomes fimbriated, and its blind end atrophies or remains as a small, pediculated hydatid. In the male it atrophies, its blind extremity often persisting as the hydatid of Morgagni (so called), a pediculated cyst at the head of the epididymis. Its length lies along the border of the epididymis, as an atrophied thread, sometimes showing hydatidiform swellings, while its other extremity is represented by the prostatic utricle.

This insight into the origin of the little cysts found normally at the head of the epdidymis explains why we sometimes have developed there a simple cyst, and sometimes a spermatic cyst. If the hydatid of Morgagni or one of the hydatidiform swellings of the atrophied duct of Müller should become enlarged into a cyst, we should have a simple cyst, for the duct of Müller never possessed any connection either with the testicle or with the Wolffian body. If, on the other hand, one of the far more numerous cysts, the remains of the upper blind tubes of the Wolffian body, should enlarge, it is easy to see how the connection which originally existed between this blind pouch and the duct of the Wolffian body (now canal of the epididymis and vas deferens) might be reëstablished (or never have been closed), and seminal elements find their way into the cyst, especially if there were some stricture of the canal of the epididymis or of the vas deferens. In the same way, if one of the vasa aberrantia should enlarge, we might readily have spermatocele. It has been supposed that some of the tubuli of the testis itself may become enlarged into a spermatocele, but this has never been demonstrated.

It tends to increase in size indefinitely. It may coexist with hydrocele, and be masked by it. It may be broken early by accident, and, continuing to secrete, form spermatic hydrocele, or it may be punctured with the trocar, when a supposed simple hydrocele is tapped.

Symptoms of Spermatocele.—When complicating simple hydrocele and jutting into the cavity of the latter, there are no symptoms by which spermatocele can be distinguished. Uncomplicated, it has peculiar features. Usually a slight uneasy sensation is experienced near the head of the epididymis, not amounting to pain, often entirely unnoticed, or at least forgotten by a patient who may afterward find the little tumor by accident. If seen early, an undefined sense of thickening with extra resistance is distinguishable by the finger, in the region of the top of the testicle. This goes on increasing, usually, at so slow a rate that the patient soothes himself with the idea that it will become no larger. It grows, however, constantly, and may attain a large size. There is no pain, except a slight dragging on the cord. The cyst keeps its position at the upper end of the testicle, and becomes gradually heart-shaped, the testicle lying below at the point, the cyst sometimes notched above. The walls are usually thin and tense, so that fluctuation cannot be always distinguished, but translucency is usually present. The fluid may be dark colored or very milky, somewhat masking translucency. The patient is very apt to become hypochondriacal, and to imagine that his sexual appetite and power are failing.

On tapping such a cyst, the fluid will usually be found milky or dark colored, and the microscope readily detects spermatic elements, often exhibiting lively movements, with others more or less decomposed, many oval heads without the tails, blood, granular and fatty matter, and some granular pigment and epithelial cells. The diagnosis can never be pronounced with absolute certainty until the microscope has detected spermatic elements in the fluid.

Treatment.—After tapping, a spermatocele will invariable refill. The proper mode of treatment is by injection or by incision, as in hydrocele.

HYDROCELE OF THE SPERMATIC CORD.

Hydrocele of the cord is either diffuse (infiltrated) or encysted. The spermatic cord is enveloped in a loose layer of connective tissue, which is continuous with the external and internal connective-tissue envelope (perimysium) of the abdominal muscles, starts at the external abdominal ring and surrounds the whole cord, the epididymis and the testicle, being firmly attached to the latter at its lower end, and inseparable from the reflected tunica vaginalis propria. The cremaster muscle is spread out upon its external surface. This loose connective tissue is described by anatomists as a separate fascia, and is called tunica vaginalis communis.

The meshes of this tunic sometimes become the seat of a diffuse serous infiltration (first described by Pott) constituting infiltrated hydrocele. Scarpa has described it as a simple œdema. Boyers recognizes it as a special form of hydrocele. Vidal doubts its existence, and Pitha never saw it. It is very rare. Curling believes it may occur in general anasarca, and saw it once complicating acute orchitis. It is mainly interesting from its liability to be confounded with omental hernia. The symptoms readily differentiate it from ordinary hydrocele.

Symptoms.—The swelling is uniform, round, and smooth, the infiltration occupying the meshes of the connective tissue; toward the base there may be one large cavity. There is no communication with the cavity of the tunica vaginalis propria. Enlarged inguinal glands or any obstruction to the return of blood from the testis, may act as causes. The swelling ceases, according to Pott, just where the vessels enter the testicle, the latter organ being isolated from the general swelling. The tumor becomes more cylindrical in shape in the supine position, but it does not disappear. Pressure makes it recede upward slightly, but it returns in any position of the patient. The penis never appears so much retracted as in simple hydrocele of equal size.

Diagnosis is with omental hernia. The latter, however, when reduced, will remain in the abdomen until the patient stands up, while the hydrocele will return in any position (Pott). The surface is firmer in epiplocele, and the swelling larger above than below. Hydrocele is not so entirely reducible, and receives no impulse on coughing. In irreducible epiplocele the diagnosis is difficult, at times impossible. Fluctuation can be felt at the bottom, but not at the top, of diffuse hydrocele. The enlargement extends to the ring. The shape is rather pyramidal, but can be somewhat altered by pressure.

Treatment.—Palliative punctures may be made at the bottom of the swelling. Large incisions are dangerous. Pott lost a case in this way. When a diagnosis with omental hernia is impossible, and an operation seems advisable, an exploratory incision may be practised.

ENCYSTED HYDROCELE OF THE CORD.

Cysts may form along the cord in the habenula (remains of peritoneal process from the abdomen to the tunica vaginalis) when its occlusion has been imperfect at certain points. The "hydrocèle en chapelet" of Cloquet is so formed. Again, cysts may be developed at any point along the cord, in its connective tissue, or in the meshes of the tunica vaginalis communis. They vary in size from a pea to a hen's-egg, or larger. They are usually tense, smooth, oval, the long diameter parallel to the axis of the cord, translucent, sometimes fluctuating, although the tension of the cyst usually makes this sign valueless. Pain is absent or insignificant. The cysts usually occur between the external abdominal ring and the testicle, but may also be found in the inguinal canal. In the latter situation it is sometimes impossible to distinguish such a tumor from incomplete inguinal hernia, without an exploratory herniotomy. When the cyst occupies this position, whether in the male on the cord, or in the female on the round ligament, unnecessary fear and anxiety are often excited in regard to hernia, and a truss or some other retaining bandage is usually applied. This always gives rise to pain, and considerably aggravates the trouble.

Treatment.—For large encysted hydrocele of the cord, injection, as in simple hydrocele, is the best treatment. Injection is inadmissible when the cysts are strung out and communicate, as the result would be necessarily imperfect. For small cysts, whether single or multiple, incision is the best treatment, care being taken to avoid wounding the constituents of the cord. Incision is indispensable for cysts situated within the inguinal canal, or where there is any doubt as to hernia. A fine seton may be used successfully in most cases external to the ring, where the cyst is small, the thread being left in till inflammation has consolidated the tumor. The patient need not keep his bed, but should wear a suspensory bandage.

HÆMATOCELE of the cord is rare, but may occur in the same way as hæmatocele of the tunica vaginalis, usually after injury. Indications for treatment are the same.

CHAPTER XXIV.

DISEASES OF THE TESTICLE.

Inflammation.—Orchitis.—Causes.—Symptoms.—Pathological Changes.—Prognosis.—Treatment.—Epididymitis.—Frequency and Date of Appearance in Gonorrhœa.—Causes.—Symptoms.—Sterility as a Result of Epididymitis.—Diagnostic Table of Orchitis and Epididymitis.—Treatment of Epididymitis.

INFLAMMATION of the testicle may be limited to the epididymis (epididymitis), or may attack the secreting structure alone (orchitis). This has been explained by the fact that the arterial supply is different for the different constitutents of the testicle. Sometimes both parts inflame simultaneously—as after injury. The secreting structure may become secondarily involved by a simple inflammation commencing in the epididymis, but the latter rarely suffers in connection with primary, true orchitis. The sub-serous connective tissue of the tunica vaginalis being in direct continuation with the connective tissue of the epididymis, in the vast majority of cases of epididymitis also becomes inflamed, constituting peri-orchitis, or acute hydrocele. Peri-orchitis, on the other hand, is rarer with inflammatory orchitis, since the dense structure of the tunica albuginea keeps an inflammation originating on one side of it from being rapidly transmitted to the other.

ORCHITIS.

Causes.—True orchitis is very uncommon. As complicating mumps (so-called metastatic orchitis) no rational theory has been advanced to account for it. Observation abundantly proves that it occurs in at least five per cent. as a complication of mumps in young adults, and the fact must be accepted without explanation. It has been noticed, indeed, during the prevalence of an epidemic of mumps, that cases of orchitis occur spontaneously in some patients whose parotids escape.[1] Orchitis due to mumps is most often observed at about the age of puberty. It comes on near the end of the first week of the mumps, and is usually confined to a single testicle. The epididymis is perhaps also involved, but may escape. The affection runs a quick course of about a week or ten days, very rarely terminates in suppuration, usually subsides without leaving any impairment of the organ behind, but is sometimes followed by atrophy. Orchitis, after severe injury to the testis, is not uncommon. It tends to terminate in abscess or gangrene, and to be followed by atrophy, with loss of function of the organ. Orchitis as a result of cold is possible.

CASE XXX.—A young gentleman, in perfect health, one summer evening sat out upon his door-step, and felt the cold stone through his pantaloons as his testicles rested upon it. The following day acute true orchitis of the right side set in, and passed through its regular stages without suppuration. Complete atrophy followed. The swelling continued to decrease in size, until nothing but the stump of the epididymis was left attached to the cord. The other testicle escaped. Afterward the remaining healthy testis became the seat of epididymitis during the course of a gonorrhœa, greatly to the patient's alarm, but this swelling subsided in due course, and got well without harming the testicle in any way. The patient afterward married, and impregnated his wife.

Sometimes orchitis comes on in children, and even in adults, where no sufficient cause can be assigned. Excessive sexual excitement has been adduced as a cause. Very rarely orchitis complicates variola or typhoid fever. A low grade of true orchitis, located in the fibrous covering of the organ, is liable to attack gouty individuals. Orchitis may come on secondarily during epididymitis. Occasionally, especially in the old or enfeebled, true orchitis originates spontaneously in patients having chronic inflammatory urethral or prostatic disease.

CASE XXXI.—In 1868, a gentleman of seventy-five, with an enormous prostate, who had been obliged to employ the catheter constantly, for many years, in order to empty his bladder, failing in health during the cold of winter, was suddenly seized with a swelling of the right testicle, which became exceedingly painful, but not very large. The swelling remained stationary for a number of days, when the patient had a sharp chill. After a few days more the organ began to grow larger, the scrotum adhered in front, fluctuation became apparent, and an incision gave exit to a large collection of matter from the substance of the testicle. In 1872, the testicle was considerably atrophied, and a fistula remained. The patient died of apoplexy in 1873.

CASE XXXII.—In 1870, a gentleman of very gouty habit, who also had enlarged prostate, was attacked by a subacute cystitis of the neck of the bladder, and ran down in health. He was obliged to continue the use of his catheter. Both testicles swelled, one shortly after the other, and, after much pain and suffering, abscesses formed in the substance of each. The epididymes and tunicæ vaginales were also, in this case, simultaneously affected with the secreting structure of the testis.

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[1] *Medical Times and Gazette*, vol. xix., p. 512.

Symptoms.—In true orchitis the increase in size of the testis generally advances rather slowly, and seldom becomes considerable until the affection has lasted a length of time. This is accounted for by the unyielding nature of the albuginea, and the fact that there is usually no effusion into the tunica vaginalis. The pain is explained in the same manner. It is often excruciating, and always out of proportion to the amount of swelling. It has been compared to that of nephritic or hepatic colic. No position gives rest, and any handling of the organ is liable to induce syncope. The irritated cremaster contracts upon the sensitive testis, and draws it up toward the groin. The pain continues high for several days, and then gradually becomes more bearable, or it may suddenly cease altogether. This last circumstance is gratifying only to the patient. The surgeon learns it with regret, for he knows that it means mortification of the organ.

The shape of the testicle is rarely altered in orchitis; it is smoothly, regularly ovoid. The epididymis is not distinguishable from the rest of the tumor. The organ feels peculiarly indurated, the natural elastic feel having entirely disappeared. The scrotal tissues are often red, swollen, œdematous, inflamed. There is a strong tendency to suppuration or mortification, the latter marked by a sudden cessation of pain. The former is often announced by the occurrence of chill. After the chill the testicle commences to enlarge more rapidly, the scrotal tissues adhere to its surface, and, after a period longer or shorter, according to the depth at which the matter forms, a soft, fluctuating spot, surrounded by indurated borders, indicates clearly the position of the purulent collection. After the pus has escaped, all the severity of the symptoms abates, unless a second purulent collection exists in some other part of the gland. The flow of pus gradually diminishes. As it decreases, the swelling subsides, and partial or total atrophy of the testicle ensues, with perhaps a fistula remaining open for years. Sometimes exuberant granulations grow up out of the opening, forming a cauliflower excrescence (hernia testis), which may reach considerable size, and, growing as it does out of an enlarged, hardened testicle, perhaps at this stage irregularly lumpy, and containing some softer spots, while at the same time the glands in the groin may become enlarged, hardened, and tender, and the general health decline—all this array of symptoms is very liable to give rise to a suspicion of cancer—a suspicion which the result does not justify.

Sometimes an abscess forms centrally in true orchitis, and never comes to the surface. In such a case the symptoms run a despairingly slow course, but the hard and tender organ gradually reduces in size, undergoes chronic inflammatory induration, while the purulent collection gradually becomes solidified, surrounded by a tough capsule; perhaps cretifies and so remains indefinitely, the function of the testicle being destroyed, unless the purulent collections have been very small. A somewhat similar state of affairs may succeed deep abscess, which has discharged and remained fistulous for a considerable time. These testicles remain long the seat of chronic pain, and are liable to repeated outbreaks of inflammation.

PATHOLOGICAL CHANGES.—On section, it is usual to find a concrete mass of more or less solidified pus in some portion of the organ, surrounded by a distinct fibrous capsule, while the contiguous structure of the testicle is modified by chronic inflammation, perhaps degenerated into a fibrous mass. Concrete pus is distinguishable from cheesy tubercle in that the latter usually lies not encapsulated in direct contact with the seminal tubules, which, though atrophied by pressure, are in other respects sound. The yellowish, gummy (syphilitic) tumor is distinguishable from concrete pus in not being (strictly) encapsulated, being usually homogeneous, consistent, tough (not friable, like concrete pus), and being infiltrated through the convoluted tubes.

TERMINATIONS.—When orchitis terminates in gangrene, after adhesion of the scrotum, the slough makes its way through the skin, and is found to be not black, or brown and fetid, like an ordinary slough, but yellowish, dry, and soft. It is a sort of dry gangrene, a necrosis, as Ricord calls it, and the slough may be pulled away in long filaments, constituted by the dead seminal tubules. Finally, two other terminations of orchitis are encountered:

1. Resolution, with a return of the organ to its full functional power.
2. Atrophy, without either necrosis or suppuration.

The general symptoms in true orchitis are marked, often severe: slight chills, pretty high fever, anorexia, nausea, vomiting, hiccough, constipation, sleeplessness, anxiety, great nervous irritation. The general symptoms have been compared to those of strangulated hernia, and, indeed, there is strangulation of the testicle within its tight, fibrous sheath.

Prognosis is always grave; the most energetic treatment is called for, to keep off impending destruction of the organ.

Treatment.—Rest on the back in bed, with the testicle supported in a sling, is essential to even moderate comfort. The patient needs no urging to keep him lying down. If the case is seen early, some of the large scrotal veins should be opened, and the bleeding encouraged, by causing the patient to sit in a hot bath, or ten to fifteen leeches may be applied in the neighborhood of the abdominal ring. If seen at the very commencement, it might be allowable to try the constant application of ice-water in bladders, but this expedient has little or no influence over inflammation once under way in the testicle. The constipation which always exists should be combated. The testicle may be enveloped in strong belladonna-ointment, or a paste composed of powdered opium and glycerine, or, if the pain be not too excruciating, in a light tobacco poultice. In short, the organ must be narcotized and held suspended by an appropriate sling, so that the venous blood may be assisted in draining out of it. The diet should be low, non-stimulating, easily digestible. The early employment of these means gives the testicle its best chance. If in spite of them the symptoms fail to abate, in short, on the slightest suspicion of impending gangrene, or in any case where the symptoms run very high, it is wise to resort without delay to subcutaneous section of the tunica albuginea, to take off tension from the strangulated parts within. This simple operation is readily performed with a sharp tenotomy-knife introduced through the skin, and then made to cut the tense fibrous capsule, while the testicle is steadied in the other hand. The incisions should be carried fairly through the tunica albuginea, several short cuts being made at different points on the surface of the testicle (three to six), not over two or four lines long. In this way the tension being relieved, the pain will usually cease, and a continuance of the means above enumerated will probably lead to resolution. If abscess form, puncture should be made on the first appearance of fluctuation. In sphacelus, carbolized water-dressings are advisable.

Nature and time alone are able in many cases to close a fistula of the testicle, left behind by the opening of an abscess. All that art can do is to make the opening a depending one, slit up sinuses, keep the parts clean, apply some stimulating lotion or injection to the sinus, and build up and maintain the patient's general health.

In benign fungus (hernia testis), besides the above means applied to the opening from which it grows, the mass itself may be cauterized, cut or tied off, subjected to pressure by adhesive straps, or, preferably, after other diseased conditions have been subdued, the edges of the wound may be incised, freshened, and united by suture after the fungus has been replaced (Syme). Fungus should never be pulled upon, for fear of drawing out the entire contents of the testicle.

In severe, long-standing cases, where a testicle is the seat of chronic induration full of fistulæ, or with large, obstinate fungus, castration is advisable, sometimes necessary, in order to remove from the patient a source of physical irritation, and to save him from serious injury to the general health.

EPIDIDYMITIS.

Epididymitis is the most common of all the diseases of the testicle. It occurs at all ages, most frequently during early adult life, and middle age, since its chief cause—urethral inflammation or irritation—most commonly exists during these periods of life. It has an acute form, but is very prone to run into the chronic state, and may be subacute from the first. It habitually terminates in resolution, rarely in abscess. One attack predisposes to another. It is often double, but the two testicles are very rarely simultaneously involved, one usually precedes the other by a number of days, or weeks, after which the disease sometimes returns to the testicle first invaded, chiefly in badly-managed cases. Fournier[1] has never seen double simultaneous epididymitis, but that it may occur is proved by the following (personal) case:

CASE XXXIII.—An old gentleman with retention from enlarged prostate, in the fall of 1871, shortly after beginning the habitual use of the catheter, was attacked with mild double epididymitis, both inflammations commencing, running their course, and terminating simultaneously.

Although the epididymis bears the brunt of the disease, it rarely suffers alone, except in very mild or chronic cases. In all acute attacks the tunica vaginalis is more or less involved, giving rise to acute hydrocele, and sometimes the secreting structure of the testis takes fire as well. One particularly interesting feature of the disease is the fact, mainly brought out of late years by Gosselin, that the chronic induration so often left behind in the epididymis by inflammation sometimes blocks up the tubes sufficiently to prevent the passage of the spermatic elements, thus entailing temporary and sometimes permanent sterility, without an accompanying loss of sexual power.

FREQUENCY OF EPIDIDYMITIS AND DATE OF ITS APPEARANCE IN GONORRHŒA.—Fournier states that epididymitis occurs about once for every eight or nine cases of gonorrhœa. In some individuals there seems to be a predisposition, so that every attack of the latter, notwithstanding the utmost care, is invariably attended by swelled testicles; while others, regardless of all hygienic precautions, go around with a raging gonorrhœa, employing perhaps no treatment, continuing sexual intercourse, and the abuse of alcohol, not even supporting the testicle with a suspender, and yet they escape. Fournier saw it develop, on the other hand, in a gonorrhœal patient with typhoid fever, who had not put his foot to the ground for six weeks. Here the generally shattered condition of the patient, brought about by typhoid fever, probably acted as a predisposing cause. It may, however, be stated dogmatically, that while a gonorrhœa of itself will sometimes, in spite of all precautions, occasion swelled testicle, yet this complication is not apt to ensue if the patient wear a suspensory bandage, abstain from violent or jolting exercise (horseback, dancing), and avoid bodily fatigue and efforts at lifting. Above all, sexual excitement or indulgence, and the use of alcohol in any shape, must be interdicted. The passage of instruments through a canal subject at the time to gonorrhœa is a sufficient cause for epididymitis. The power of the suppressive treatment of gonorrhœa by strong injections early in the disease, although somewhat active, has been overrated. It should, however, be borne in mind. Balsams and terebinthinates internally cannot give rise to the affection.

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[1] Art. "Blennorrhagie," "Dict. de Méd. et de Chir. prat.," p. 211.

The remarks already made concerning the liability to epididymitis in gonorrhœa apply with about equal force to cases of stricture. Some patients suffer from the worst of the inflammatory sequences of stricture, but the testis escapes; while in other cases, perhaps of mild type, one or the other epididymis will be constantly falling into trouble on the slightest provocation, until the normal condition of the urethra has been restored. The treatment of stricture by instrument may itself originate epididymitis.

As to the date of occurrence of gonorrhœal epididymitis, Fournier has a personal tabulation of 222 cases, of which there occurred—

In the first	week	0	Making in the first	month	86
" second	"	22	" second	"	78
" third	"	34	" third	"	22
" fourth	"	30	" fourth	"	6
" fifth	"	29	" fifth	"	6
" sixth	"	19	" sixth	"	4
" seventh	"	9	" seventh	"	3
" eighth	"	21	" eighth	"	3
			" ninth	"	4

later 10, of which in the seventh year 1; most of the latter cases depend evidently upon stricture.

De Castelnau's exhibit,[1] derived from the statistics of four surgeons, shows a total of 239 cases, of which there occurred—

In the first	week	16	In the fourth	week	39
" second	"	34	" fifth	"	54
" third	"	24	" sixth	" and later	72

Unfortunately, this "and later" is deceptive, since it includes all cases of epididymitis due to stricture.

It is probable that, as a rule, the time for the occurrence of epididymitis in gonorrhœa has been set down a little too late. In every-day practice it is perhaps nearly as common to find this complication before as after the sixth week. In a general way it may be laid down that epididymitis is to be looked for mainly from the third to the eighth week of gonorrhœa.

Causes.—Nearly all the causes enumerated as capable of producing orchitis may also exceptionally give rise to epididymitis: traumatic violence, cold.

CASE XXXIV.—In 1869, a coachman, driving during a cold rain, sat for some hours in a pool of cold water, which collected upon the leather cushion under him. On the following day he was attacked by a perfectly characteristic epididymitis, which ran the usual course, without affecting the secreting portion of the testicle, and terminated in resolution.

Prolonged sexual excitement has been enumerated, and gout, but urethral inflammation or irritation is by far the most active cause. The most common form of this irritation is gonorrhœa, or urethritis, then stricture, finally any prostatic or urethral irritation, the passage of instruments, especially through a urethra already affected by mild chronic inflammation or stricture, but occasionally where no appreciable disease exists, the use of the lithotrite, cutting operations for stone, retention of a small calculus or stone fragment in the prostatic urethra; in short, any inflammatory affection of the prostatic sinus around the orifices of the ejaculatory ducts.

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[1] Quoted by Bumstead.

It is probable, with all this last series of causes, that the mechanism of the cause is identical; namely, that the prostatic sinus in the neighborhood of the orifices of the ejaculatory ducts first becomes inflamed, if only slightly, and that the inflammation, starting there, travels rapidly down the continuous mucous membrane of the vas deferens to the epididymis, where it locates itself. That this is sometimes the method of propagation is demonstrable by the course of the symptoms, and by the traces of inflammation occasionally found in the vas deferens after death; but in the vast majority of instances the inflammation, passing rapidly through the vas deferens, announces its course by no symptoms, and leaves no vestige of its presence behind. This has induced Brown-Séquard to deny that epididymitis is a transmitted inflammation, and to claim that it is a reflected irritation. He draws a comparison between the passing of a sound through a seemingly healthy urethra, or an inflammation existing in the canal, and the subsequent epididymal swelling, and ulceration of the small intestine after extensive peripheral burns. Fournier has cautiously emitted the theory that epididymitis may be a specific gonorrhœal affection of the rheumatic type, like the gonorrhœal (rheumatic) affections of the eye; still this would fail to account for epididymitis from the passage of an instrument or the lodgment of a stone fragment. To sum up briefly, the theory most plausible and best borne out by observed facts is, that epididymitis from urethral inflammation or irritation is a direct but sudden transmission of inflammation over a continuous membrane, from the orifice of an ejaculatory duct to the epididymis. This is further supported by the following facts: Epididymitis from gonorrhœa rarely comes on early in the disease, unless instruments or irritating injections have been used, but occurs toward the end of the causing malady, just when the latter occupies the lower end of the urethra. The mucous membrane behind a tight stricture is always more or less inflamed, and this inflammation is liable at times, in bad cases, to run backward and affect the neck of the bladder. Under these circumstances, mild, continuous forms of epididymitis are not uncommon. The deeper down the urethra the stricture lies, the more apt is epididymitis to complicate it. Instrumental interference, or the retention of a stone fragment in the forward parts of the urethra, is very rarely attended by epididymitis, while this complication is not uncommon when the same irritation is applied to the prostatic portion of the canal.

Symptoms.—Epididymitis may come on in an acute or a subacute form, the latter where the epididymis has previously suffered from a similar attack. First attacks, like first attacks of gonorrhœa, are usually the most severe. Epididymitis is ushered in by premonitory symptoms which precede the swelling by some hours. Gonorrhœal or gleety discharge is usually not visibly modified until after the testicle begins to swell. Then it becomes lessened, perhaps stops, to return again as soon as the inflammation of the epididymis is fairly on the decline.

A vague uneasiness is felt in the testicle, and along the cord up into the back, as if the cord were being pulled upon. Attentive patients will frequently aver that the pain was noticeable in the groin for some hours before any uneasiness was experienced in the testicle. This forerunning inguinal pain is rarely absent where the epididymitis is of urethral origin—except in hospital patients, who are unintelligent observers. There is usually only a slight painful tension in the groin, but sometimes it is very severe, extending around to the lumbar region, and up the back. Sometimes there is a sense of weight in the perinæum, frequent desire to urinate, with perhaps pain and difficulty in the act. Occasionally a chill, with febrile action, will usher in the affection, but these symptoms are far more constant with orchitis.

Whether any of the foregoing symptoms have attracted attention or not, within a few hours decided pain is felt in the testicle, attended by a rapid increase in size. The amount of pain and swelling varies in different cases. In the subacute form of patients with stricture, the swelling is moderate, comes on rather slowly, palpation at once distinguishes the heat, sensibility, and hardness of the epididymis, and that the testicle itself is less affected. Peri-orchitis is absent, or not marked. There is but little, if any, fluid in the tunica vaginalis, or it may be felt loosely in the sac, not causing any considerable distention. With such mild cases there are no general constitutional symptoms, and the pain is not excruciating. It is aggravated by the erect posture, but wholly disappears after the patient has been on his back, with the testicle elevated, for a few moments. The scrotal structures escape implication.

But the picture changes vastly for the onset of an acute attack. The swelling commences promptly, and increases with rapidity. First it is localized posteriorly, but soon the subserous connective tissue of the tunica vaginalis carries the inflammation to the latter structure, which rapidly inflames, pouring out a plastic material upon its surface, and a sero-sanguinolent fluid into its cavity, which becomes rapidly tense and distended, greatly adding to the pain. The secreting structure of the testicle is often distended fully with blood, but is not the seat of any pathological changes. The scrotal tissues inflame and become œdematous, large veins sometimes appearing on its surface. Yet, even under all these disadvantageous surroundings with an œdematous scrotum, and a tensely-filled tunica vaginalis, careful examination will rarely fail to localize all the hardness and most of the pain in the epididymis. The inflamed mass rapidly reaches the size of the first, but its shape is not so evenly oval as in orchitis. The cord becomes swollen, and painful on pressure. Occasionally so much inflammatory swelling exists here, that the cord becomes partly strangulated in the inguinal canal, since it is impossible for it to swell much there, surrounded as it is by firm fibrous structures. This gives rise to all the well-known symptoms of inflammatory strangulation—excessive local pain, great prostration, anxiety, vomiting, perhaps hiccough.

Pain in acute epididymitis is great, increasing from the first proportionally with the rapidity of growth of the swelling. The pain, however, is not so severe as in true orchitis. It is of the sickening variety, making patients feel faint. Locomotion is almost (sometimes quite) impossible, the motions of the patient are very deliberate as he changes his position, and, if necessitated to stand, he carefully supports and shields his swollen scrotum with his hand. Rest on the back, with the testicle raised, while it modifies, does not allay the pain, but in this position the torture is more bearable. If strangulation of the cord at the ring occurs, the pain is greatly intensified, resembling that described for acute inflammatory true orchitis, being, in fact, dependent on the same cause—inflamed tissues strangulated within unyielding fibrous coverings. If some inflammation of the body of the testis exist, the pain will be proportionally heightened.

As the disease advances, pain increases in intensity for several days (three to six), remains stationary for several days after the organ has reached its full size, and finally begins to decrease, and, even in desperate cases, by the end of the second week has usually disappeared, or become reduced to the slight dragging uneasiness which constitutes the only pain of mild cases. This relief from pain is often experienced while the organ is yet large, the epididymis thickened, the scrotum œdematous, and some fluid still left in the tunica vaginalis. For several days after the pain has ceased, a few moments in the erect posture, with the testicle hanging, will recall it. The form and size of the swelling vary greatly. In the mildest cases the tail of the epididymis alone suffers. All the inflammation localizes itself there, forming a hard, sensitive lump, giving a little uneasiness unless supported, every thing else being normal. The head, together with the tail of the epididymis, may suffer, nothing else being involved, or the whole of the epididymis, while the gland proper may be felt normal in every respect in front of the inflamed mass. The vas deferens may be also involved in mild chronic cases, as in the tuberculoid varieties. It may, however, in any inflammation of the epididymis, be increased in size (perhaps greatly so), and painful on pressure. In very acute attacks the whole cord is sensitive and hyperæmic. The seminal vesicles are also occasionally inflamed at the same time. Very rarely peritonitis has been seen to come on, provoked by the last-named complications (Hunter, Velpeau, Ricord).

If the disease be at all acute, the tunica vaginalis is sure to be involved, the degree of its inflammation usually, but not invariably, coinciding with the intensity of the epididymitis. This peri-orchitis varies greatly. Fluid may be rapidly poured out, filling the sac to its utmost, giving rise to a tense swelling of considerable size, in which case it becomes impossible to distinguish the constituent parts of the testicle. This form is often attended by excruciating pain, relieved, as if by magic, by puncture of the tunica vaginalis. Again, but little fluid may be effused. This, lying loosely in the sac, fluctuates freely, and does not in the least obscure the fact that the main disease is in the epididymis. The fluid may be absorbed speedily, allowing the plastic material effused with it to glue together the two surfaces of the vaginal tunic, or perhaps only to form numerous bridled adhesions. Some fluid may remain throughout—the nucleus of future hydrocele. In acute cases the scrotum may be so inflamed and œdematous as to give a very exaggerated idea of the size of the tumor.

The constitutional symptoms, fever, loss of appetite, etc., are mild, with epididymitis, do not occur at all in chronic and subacute cases, and in acute cases, like the pain, vary with the intensity of the inflammation. What fever there is disappears before the pain, and long before the swelling.

Epididymitis may be said to have a natural limit for its acute symptoms of about two weeks, but relapses are very common, and carelessness may prolong the trouble to as many months. Hardness of the epididymis may remain behind for months, or even years; such indurations retain their sensitiveness on pressure for a long time. Relapses are always milder than first attacks. If the other testicle inflame before the first is well, the latter runs through its course more quickly.

The gradual disappearance of the hardness from the epididymis may extend over many years, and in some cases is never accomplished entirely. The body first attains its natural feel, then the head, and, last of all, the tail. The absorption starts rapidly, but progresses more and more slowly, until in some cases it seems to rest stationary. In such cases the little hard lump at the bottom of the epididymis occasions the patient no uneasiness, is not sensitive to pressure, and is ignored. Suppuration is very rare in true epididymitis, not tuberculoid in character; atrophy never occurs unless the substance of the testicle has been involved.

Sterility.—In connection with the sterility often following double epididymitis, the pathological changes seen on section are instructive, and fully explanatory. In the early stages, hyperæmia, plastic, serous, and sanguinolent effusions occur. These plastic deposits take place in the cavity of the epididymal tubules as well as around them, gluing them firmly together, so that after a certain time, especially in the tail of the epididymis, nothing can be distinguished on section but a homogeneous mass, in which the eye seeks in vain to trace out the convolutions of the epididymis or the course of its canal. In the case of a patient of Velpeau,[1] an examination of the specimen by Robin disclosed the fact that the hard lump occupying the epididymis was homogeneous, resembling cheesy tubercle on section. The convoluted tubes inclosed in this mass were dilated to several times their ordinary size, but filled with the products of inflammation; pus-corpuscles, fatty *débris*, granulation bodies—all of this being within and none without the tube, looking as if all the inflammatory action had expended itself in producing secretion in and upon the free mucous surface, not extensively involving the peritubular tissue. Gosselin[2] found in his interesting dissections that the canal in the lower part of the epididymis was often impermeable, the tubes beyond the obstruction being sometimes dilated, sometimes normal.

Testicles in these cases of obstruction do not atrophy, nor do the seminal vesicles of the same side undergo any change. For purposes of prognosis, it is well to recall the anatomical fact that the head of the epididymis is formed of many tubes (coni vasculosi), all going to unite with and pour their secretion into the canal of the epididymis. Hence chronic induration here may have allowed one or more tubes to escape, and sterility is not so inevitable. The tail of the epididymis, on the other hand, as Gosselin sagely pointed out, is composed of the convolutions of one tube. This tail of the epididymis, too, is just the spot where the chronic induration left behind by epididymitis is apt to become localized. The tube obliterated here cuts off communication with the testicle, and, if both sides are affected, no spermatozoon can reach the urethra.

Yet it is well to know that even in these cases affairs are not always desperate. The patient is by no means impotent, his sexual power and appetite are unimpaired. He ejaculates semen resembling the healthy fluid in quantity, smell, and color, only it contains no spermatozoa, and consequently he is sterile. The same holds good usually of a monorchid, who has epididymitis on the sound side, for the retained testicle seldom furnishes spermatozoa. This sterility lasts from a few months to twenty years, perhaps indefinitely. It disappears with the induration, sometimes before. There is always hope that a well-directed treatment may cause the latter to disappear by absorption, and restore the patient his fertility.[3]

A curious fact in connection with this subject (showing the bound-ess kindness of Nature in doing every thing to preserve the genital functions uninjured) is, that the testicle does not atrophy, no matter how long its duct may be occluded, and, if the latter finally become pervious, the testicle is ready for use. Animals have been experimented upon by having their vasa deferentia cut, but the testicle does not atrophy. Healthy spermatozoa are found in it months afterward (Curling). Another curious fact is, that in man sexual intercourse may be practised without (as might have been expected) causing painful, or inducing any, swelling of the testicle or upper portions of the epididymis from the accumulation of spermatic elements.

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[1] Reported in the *Gazette des Hôpitaux*, December, 1854.

[2] "Archives Générales," Fourth Series, xiv., xv.

[3] Langelbert, "Syphilis dans sa Relation avec le Mariage."

In the vast majority of cases time alone will remove the indurations, and with them the sterility.

Diagnosis.—The following table may be of service as bringing into contrast the most marked diagnostic differences between true orchitis and epididymitis. Of course when orchitis complicates epididymitis the symptoms will be mixed.

Orchitis.	*Epididymitis.*
1. Very rarely encountered.	1. A very common affection.
2. Causes usually, injury, mumps, gout, cold, etc.	2. Cause almost invariably urethral inflammation or irritation.
3. Pain usually excruciating, and not relieved by position, while enlargement is still moderate.	3. Pain usually bearable except with extreme enlargement, always modified by position, except in cases of strangulations of the cord.
4. Shape of tumor oval.	4. Shape oval, roundish, oblong, often irregular—especially from scrotal œdema.
5. Epididymis not distinguishable from the rest of the tumor.	5. Epididymis distinguishable from the rest of the tumor, enlarged, indurated, and particularly tender; testicle often perceptible, of natural feel in front of it. These symptoms, perhaps obscure for a few days, at the height of the affection, always hold good during the period of decline.
6. Testicle of peculiar hardness, very sensitive.	6. Testicle often normal in front of epididymis; perhaps hard from inflammation of its tunics, but not as sensitive as in orchitis.
7. Rarely any fluid in tunica vaginalis.	7. Always fluid in tunica vaginalis in acute cases.
8. Constitutional symptoms usually present.	8. Constitutional symptoms absent or unimportant.
9. Termination in resolution, abscess, gangrene, chronic induration, or atrophy.	9. Termination habitually in resolution, leaving slight chronic thickening of tail of the epididymis behind.
10. Never followed by sterility except as result of destruction of tissue, and then, if both sides have suffered, by impotence as well.	10. Often followed by temporary, sometimes indefinite, sterility if both sides have suffered; never by impotence.
11. Course often slow.	11. Course generally rapid.

Treatment.—The prophylactic treatment of epididymitis is the use of a suspensory bandage during the existence of urethral disease, together with a strict observance of the hygiene of the urethra (p. 40). When, late in gonorrhœa, or during treatment of stricture, complaint is made of a dragging, uneasy sensation in the groin, or testicle, the patient should be immediately placed upon his back, with the testicle elevated, and the threatened attack may thus be often averted.

In mild cases, where rest on the back with elevation of the testicle is sufficient to quiet pain, these means alone are required to effect a cure, perhaps aided by a light, hot flaxseed-poultice, and a laxative. In a few days the patient can stand, and, by supporting his testicle, walk without pain.

In acute cases the treatment must be more active. Rest on the back and elevation of the testicle over the abdomen are indispensable. The latter cannot be secured by a suspensory bandage, since that supporter allows the testicle to hang down; nor is it well to trust to pillows and compresses under the testicle, since they allow the patient no motion. No improvement on Curling's method has yet been suggested. It consists simply in a handkerchief, or piece of bandage, around the waist, and a large (preferably silk) handkerchief, folded in triangle. The base of the triangle is placed under the scrotum; one (acute) angle on each side is tied to the waistband, the other (right) angle is brought up over the testicles and penis, serving to retain dressings, and is pinned or tied to the waistband. If the testicle be not very large, or the patient move much, the sling tends to slip up in some cases. This may be easily obviated by sewing a tape to that portion of the sling immediately under the scrotum, carrying it between the nates and attaching it at the back to the waistband.

In all inflammatory diseases of the testicle this bandage is of the first importance. Having arranged it, the patient is put to bed with the testicle enveloped from the start in a tobacco-poultice. In cases that require any active treatment at all, and where pain and swelling are already present, any cold or astringent application is harmful. The object is to narcotize the testicle at once, and quiet pain, and this, in the vast majority of instances, tobacco, heat, and position, will do.[1] The poultice is made by mixing a paper of any fine-cut tobacco (℥ j) in about ℥ x of hot water, bringing the whole to a boil while stirring it briskly, and then adding ground flaxseed, with or without ground elm-bark, until the proper consistence of a poultice is obtained, stirring the tobacco well in with the meal. A poultice of this mass is made about a quarter of an inch thick, and large enough to envelop the whole testicle. A piece of fine muslin is put on the surface of the poultice, which is perhaps sprinkled with laudanum, and placed upon the testicle as hot as it can be borne, the whole covered with a piece of oil-silk—for cleanliness' sake as well as to retain the heat—and supported in the handkerchief-sling above described. Ordinarily, the testicle will be narcotized, and nearly painless in a few hours, unless the patient attempt to stand upright. The poultice is to be renewed every eight hours, and these applications continued steadily until the indurated epididymis has quite or nearly lost its sensitiveness to pressure, when the patient may commence gradually going around, wearing a suspensory bandage containing some woolen batting.

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[1] The tobacco-poultice was subjected to the test of a thorough trial through many years at the New York Hospital. It proved itself more serviceable than any other agent.

Ordinarily, the acute stage of the disease requires not a whit more of treatment than this to effect speedy resolution. A laxative, with a tempered regimen, is always appropriate where a healthy man is suddenly confined to his back.

In conditions, however, of extreme pain, where the disease is exceptionally acute, we have at our command powerful means of relief. When the cord has become strangulated, and position does not bring relief, from ten to fifteen leeches above the groin, along the course of the cord, will often calm the pain as by magic. The bleeding should be encouraged by the use of hot water. This is much more efficient than the extraction of blood from the scrotum. Another cause of excessive pain, in some cases, is extreme distention of the tunica vaginalis with fluid. A puncture to let this out is followed by striking and immediate relief. Some authors advocate puncture of the tunica vaginalis in all cases, whether it be tensely distended or not, stating that it moderates the pain and shortens the attack. It is often unnecessary, and need not be resorted to where position and local narcotism suffice to quiet pain, as they usually will.

Patients with swelled testicle are sometimes unruly, and refuse to go to bed, taking narcotics and wearing a poultice while they continue at their work. Such a course is certain greatly to prolong the duration of the attack, and to be followed by chronic induration of the epididymis, which is very apt to be obstinate, and to entail sterility, as far at least as one testicle is concerned. Then, again, the impatience of restraint, felt by a man lying on his back and suffering no pain, often induces him to leave his bed too soon, and thus sometimes a relapse is provoked. Patients anxious about business or concealment should be advised from the start that they will save time and trouble, and perhaps avoid destroying the functional activity of the testicle, by yielding to the necessities of the case at once and going to bed. They may be assured that often four or five days are enough, and that not more than a week, or, in the worst cases, ten or twelve days in bed will be required, if they will observe the horizontal position absolutely for that period. In such a case leeches to the cord, puncture of the tunica vaginalis, and diligent poulticing will bring the testicle in a week to a condition of comparative repose, not paining when let alone, but still, perhaps, several times larger than its fellow, painful on manipulation, and in the erect posture. Under these circumstances, the patient may employ his time as he chooses, and go about at will if the testicle be strapped.

Strapping a testicle to reduce swelling, first proposed by Fricke,[1] of Hamburg, has not met with the favor it deserves, for two reasons:

1. It takes time, trouble, and some experience to apply it so as to give comfort, and be of service.

2. If unskillfully applied, it either does no good, or causes pain, and actually does harm. It has been known to occasion gangrene.

In declining epididymitis, however, this agent, properly employed, is most valuable in abridging the duration of treatment. When the organ is still quite sensitive to pressure, some days before the patient can walk with comfort, even with his testicle suspended, if adhesive straps be carefully and snugly applied, locomotion without pain is at once possible (with a suspender), and there is no fear of a relapse.

Strapping is performed as follows: The hairs are cut from the scrotum, and strips of adhesive plaster[2] prepared from one-half to three-quarters of an inch broad (according to size of testicle), and six to eight inches long. The patient now sits on the edge of a chair in front of the surgeon, with his knees widely separated. The testicle is caught in the hand, gently rolled and manipulated until the scrotum relaxes, and the thumb and finger can encircle the cord easily above it. The position of the encircling finger upon the scrotum is accurately noted with the eye; the patient is instructed to seize the testicle lightly, and hold it in position; a piece of bandage long enough to encircle the testicle, and about two inches wide, is rapidly placed around it, its centre corresponding to that portion of integument previously encircled by the thumb and finger, and a strip of warmed adhesive plaster is placed at once over the centre of the bandage behind and one end brought round to the front and secured. The surgeon now seizes the top of the testicle, draws lightly upon it, at the same time producing constriction with his thumb and finger above, and with the other hand pulls upon the free end of plaster, brings it rapidly around to the front following the central line of the bandage, and attaches it under tension to the back surface of the other end of the same strip. Now the testicle may be dropped. It will be seen to be covered by a tense, shining, perhaps purplish-looking integument, pretty tightly constricted above by a strip of plaster, the latter margined all around on both sides by about three-quarters of an inch of bandage. The object of the bandage (prepared lint is perhaps better) is to keep the sharp edge of the adhesive strip from cutting into the tender scrotum, an accident which always happens to a patient strapped without this precaution, who walks about, and sometimes even in spite of it.

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[1] Fricke's proposition was to strap a commencing swelling, and thus prevent it. This is impossible.

[2] Bumstead's suggestion of two parts of adhesive plaster with one of extract of belladonna, spread on thin leather, is a good one. It does away with the necessity of any lint or bandage under the top strap.

The first strap is put on tight enough to cause a little uneasiness. It has to be snug, or the straps subsequently applied would push the testicle through it. The remaining straps are adjusted in circles, each one covering about half of its predecessor, and all applied with a certain degree of tension which can only be learned by personal experience. After a number of straps have been applied, it will be found that they will no longer adhere (in a circular direction) to the purple, tense, bulging extremity of the scrotum. This portion is consequently covered in from the sides, and from before backward, by attaching a strip of plaster at a given point, high up over the circular strips, bringing it down and tightly across the bulging end of the testicle, and attaching it high up over the circular straps at a point exactly opposite that from which it started. In this way, by starting at successive points, the whole of the exposed skin at the end of the testicle is covered tightly in. One or two more circular straps may now be applied to keep the lateral ones from slipping. The whole looks something like a large cartridge.

A certain amount of soreness follows this apparently rough handling, and it is well for the patient to lie down again for half an hour, to find out whether the strapping feels comfortable or not. If properly applied, comfort will have returned by that time, and the patient may now place his testicle in a suspensory bandage to keep it from dragging upon the cord, and go around at will without fear of pain or a relapse. By the mechanical action of the evenly-adjusted pressure, the blood is kept as thoroughly out of his testicle as it was by his position in bed. If the straps cause pain after half an hour, they should be removed. Straps need to be reapplied every twenty-four or forty-eight hours, whenever they become loose. If they have been carelessly put on, any point where the pressure is uneven will become œdematous. There is habitually some œdema about the bottom of the scrotum on removing the straps, but it is of no importance. The straps may be detached by cutting each one separately, or they may be conveniently removed all at once in a hot bath. After removal, new straps should be applied immediately. Ordinarily after four or five strappings, extending over as many days, or perhaps a week, the testicle will be found to be reduced nearly to its natural size, a certain amount of hardness still remaining in the epididymis, perhaps confined to its tail. This hardness, as a rule, subsides spontaneously in a few weeks, in cases which have been judiciously managed; sometimes, however, it remains for years. Its departure may be hastened by keeping the testicle constantly in a suspender, covered by oil-silk, so as to keep up slight constant heat and moisture, of course treating any urethral disease which may exist. Sometimes it seems as if the continued use of mild mercurial ointment under the oil-silk hastened the absorption. No known medicine is of any proved service, iodine and iodide of potassium included. Tonics and cod-liver oil do good by improving the quality of the blood.

Nothing has been said of internal medication in the treatment of epididymitis. No medicine has any specific power over it. Gonorrhœal treatment may be continued, as it does no harm. Injections into the urethra are best intermitted.

CHAPTER XXV.

DISEASES OF THE TESTICLE.

Pseudo-tubercular Epididymitis.—Tubercular Testis.—Symptoms.—Pathology.—Treatment.—Syphilitic Epididymitis.—Syphilitic Orchitis; Interstitial; Gummy.—Cancer.—Sarcoma.—Diagnostic Table of Syphilitic Testis, Tubercular Testis, Cancer, Sarcoma, including Diagnostic Features of Different Fungi.—Castration.—Dermoid Cyst.—Irritable Testis.—Neuralgia Testis.

PSEUDO-TUBERCULAR EPIDIDYMITIS is very rare. It is simple, slow, chronic inflammation. Désormaux and Fournier[1] seem alone to have called especial attention to it. It is peculiar in being observed, as a rule, only in the course of chronic urethral discharges, and because it simulates tubercularization with the most absolute accuracy, so as to be usually mistaken for it.

It comes on during chronic urethral discharge, often without appreciable, immediate exciting cause, either as a subacute epididymitis, very indolent and not yielding to ordinary treatment, or, even more insidiously, it commences in an absolutely indolent chronic form, simply characterized by knobbed, irregular points of induration in the epididymis, slightly sensitive to pressure. The swelling increases slowly, but the pain ceases, until after a time we may have a large, knobbed, irregular epididymis, a healthy testicle, more or less fluid in the tunica vaginalis, and, perhaps, the vas deferens, which not infrequently participates in the disease, swollen to the size of a pipe-stem, hard, slightly sensitive to pressure, smooth, or knotty and irregular.

There is now a strong tendency to suppuration, and one or more abscesses may form in the epididymis, or possibly in the vas deferens, and discharge externally. Such abscesses long remain fistulous, and closing leave a nodosity which is slow to disappear. Sometimes matter forms near the tail of the epididymis, but the abscess finally dries up without discharging. This may leave a hard, insensitive shot or marble-like lump, freely movable in the scrotum, and connected with the tail of the epididymis by a pedicle. Such curiosities are occasionally encountered. Sometimes resolution is effected after many weeks, perhaps months, without suppuration.

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[1] Art. "Dict. de Méd. et de Chir. pratiques."

CASE XXXV.—A young gentleman while undergoing treatment for stricture had an attack of epididymitis, which ran its course and got well. Some months afterward, in the early spring, after a winter's hard work at an exciting business, he commenced to run down perceptibly. His gleet, which had ceased, returned, although he continued to use a full-sized sound, and he suffered from an attack of pseudo-tubercular epididymitis. The use of poultices, ointments, and all ordinary means, combined with tonics, failed to effect any improvement. Abscess formed, the vas deferens became as thick as a pipe-stem, the patient was pallid, and more than ever run down. He was now induced to give up business and go to the country, as the only means of safety. He was fortunately very fond of milk. On reaching the country he was directed to give up cod-liver oil and tonics, to stop all medication, general or local, and to live on milk, bread, meat, and fruit. A little abscess which had formed discharged, but general improvement set in at once. The patient gained in flesh and spirits. He continued to use the sound, and his urethral discharge ceased. His abscess closed, and after two months the epididymis and vas deferens had returned nearly to their original size. The following winter they became absolutely normal to the feel.

During this winter, however, again the patient overworked himself, and appeared again in the spring with a precisely analogous condition of disease in the epididymis and vas deferens of the other testicle, but not so far advanced as the previous year. His gleet and general running down had also returned. He still used his sound regularly. The country was again resorted to as a means of treatment, the patient continuing to come to town to his business, wearing a suspensory bandage. No abscess formed, but complete recovery ensued after some months. He is now—three years after his last attack—perfectly well. No induration remains.

CASE XXXVI.—Another patient with this form of disease, occurring under precisely similar circumstances, could not be induced to leave town. No treatment seemed to benefit him materially, till after some months he was lost sight of.

The above cases indicate the outline of treatment. It is doubtful if any local measures are of advantage except the wearing of a suspensory bandage.

The treatment is hygienic and tonic, in fact exactly the same as for tubercular epididymitis, but with more hopes of entire success.

TUBERCULAR TESTIS.

Tubercular disease of the testis is usually described as occurring in two forms—one as a continuation and degeneration of chronic inflammatory thickening, left behind by previous disease; the other spontaneous, tubercularization coming on without apparent local cause, and unconnected with any urethral disease. The first of these forms has been described above as pseudo-tubercle. It always affects the epididymis primarily, may extend thence to the vas deferens and seminal vesicles, and finally involve the testis proper as well. It is distinguished under a different head from tubercle proper. Its prognosis is much better. If not arrested, however, its advanced stages may be identical with those of true tubercular testis, and its terminations the same. The pathology of the affection is cheesy degeneration of inflammatory products effused inside of, as well as outside of, the seminal passages.

Tubercular testis proper has certain peculiarities of its own. Its pathology is cell-proliferation, totally outside of the tubes and ducts

(Rindfleisch).[1] Tubercle of the testis does not seem to occur in the miliary form.[2] It comes on without appreciable provoking cause in lymphatic, strumous, or tubercular subjects, sometimes in young men apparently perfectly healthy. It is most liable to appear during early manhood just after puberty, when the physiological activity of the gland is most marked. It may appear in childhood.

Symptoms.—The deposit takes place by preference in the epididymis, but the secreting structure usually also suffers later (Rindfleisch). There is no pain, so that it is usual for the disease to pass unnoticed until by accident the patient's attention is attracted by the fact that one testicle is larger than the other. Sometimes, where the deposit is rapid, slight pain is experienced. On examining such a testicle, it is usually found large, hard, and lumpy behind; but the whole organ is often also hard, irregular, unevenly nodular. There is perhaps some fluid in the tunica vaginalis, obscuring the outline of the testis. The vas deferens is often knotty, enlarged, and hard as far as it can be felt, and a finger in the rectum may detect the seminal vesicle similarly affected. There may also be (more rarely) tubercular prostatitis or evidences of tubercular kidney. The testicle feels heavy, the skin over it is unaltered, pressure does not cause pain (unless abscess be forming), nor does it occasion the sensation felt when the healthy testis is squeezed. It is not uncommon for both testicles to be affected, the one in a more advanced stage than the other. If both are involved, the sexual appetite is usually reduced or absent. The malady advances slowly, sometimes remaining stationary for many months; finally the nodules soften into abscess; the skin becomes œdematous, adheres over the epididymis, the patient has a little pain for a few days, when the abscess bursts and discharges a thick, cheesy material, containing, if the body of the testicle has ulcerated, portions of necrosed seminal tubules from time to time.

These abscesses remain fistulous for a long time, sometimes indefinitely, the fistulous tract being marked by great induration from chronic inflammation. New abscesses tend to form, pointing by old or new routes. After abscess of the substance of the testis, hernia testis may come on, and, when the disease mounts the cord, the inguinal glands are not infrequently enlarged. These cases are often mistaken for cancer, and as such extirpated and recorded as fortunate cases of removal of cancer, with no return of the disease. A patient may have both testicles indurated, knobbed, full of fistulæ for years, and still seem to be enjoying excellent health, with the exception of more or less loss of sexual desire and power, but usually he is pale, thin, anæmic, weak, perhaps with tubercular deposits in his lungs or elsewhere.

For differential diagnosis, *see* table after SARCOMA. As to prognosis, a tubercular testicle is not necessarily lost. Pseudo-tubercular disease also is often indistinguishable from it.

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[1] "Histological Pathology," second edition.

[2] Virchow, however, admits it.

Pathology.—Tubercular nodules are developed in the connective tissue (or lymph canals) around the seminal tubes and ducts. These partly organize into fibrous tubercles. The tubercles coalesce into large masses, dirty yellow on section, in direct connection with healthy tissue, not encysted; and then, their vitality being low, cheesy degeneration of the centre takes place. After a variable period the mass breaks down, and is partly eliminated by abscess.

Rindfleisch,[1] following Langhans and Klebs, believes tubercle to be the result of endothelial proliferation in the lymphatic spaces surrounding the seminal tubules.

Treatment.—In tubercular disease of the testis the treatment applied may save not the patient's life, for that is rarely implicated, but his sexual power, his peace of mind, and may give life to his children. It is hard to convince such patients that medicine is not the best thing for them, and they suffer so little pain that they are slow to see the necessity of giving up their business and living an easy out-door life in the country. Some patients, unfortunately, cannot follow this course, and their case is sad indeed. Others can, but will not recognize the necessity of it.

The chances are not encouraging or the hope very great, but in all cases where there is a hope that the disease may be pseudo-tubercular, where only the epididymis is involved, the testicle being healthy, where only one organ is affected or even where both suffer, but the disease has not advanced far, the surgeon's duty is plainly to throw the whole weight of his influence into the scale, to induce the patient to flee into the country, to change his air and his surroundings, preferably to go to the sea-side, or to some southern climate, and to observe all the conditions of physical hygiene suitable to tubercular cases. A suspensory bandage is useful, with the testicle enveloped in oil-silk.

These means exhaust our best resources. Local dressings to the testicle are of no avail, except to amuse and satisfy the patient. If abscess form, it should be poulticed, and induced to point quickly, the other treatment being followed unremittingly. Cod-liver oil, the hypophosphites, phosphate of lime, iron—especially the iodide—quinine, cinchona, and to the end of the chapter, are of service as general tonics. Arsenic has value, and possibly iodide of potassium a little. The latter has been greatly overrated. Mercury is of no service. Both mercury and iodine have undoubtedly derived their reputation from curing cases where a syphilitic testicle has been believed to be tubercular, a mistake sometimes not easy to avoid in obscure cases. The rule of treatment in tubercular testis is imperative. Do not lose time by trying drugs. Let the patient get a change of air at any sacrifice to himself, and let him take his medicine while he is using the stronger agents, intelligent hygiene and dietetics.

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[1] *Op. cit.*

Case XXXVII.—A gentleman, with commencing double tubercular testis, complicated by hydrocele requiring the use of the trocar, got entirely well during an expatriation of eighteen months, from New York to Syria. The patient afterward married and had a family. As a rare symptom, the patient lost blood from the urethra coincidently with the occurrence of the tubercular deposit, and the effusion into the tunica vaginalis, thus establishing a singular analogy with pulmonary phthisis, and its hæmoptysis and pleurisy.

SYPHILITIC TESTIS.[1]

Syphilitic disease of the testicle has become of late years a well-recognized affection, and has, indeed, absorbed into itself, according to agreement by most modern authors, most of the cases which were formerly described as chronic inflammation of the secreting portion of the testicle. It is not, indeed, too much to say that perhaps all cases of chronic enlargement of the testicle of a seemingly inflammatory origin, excepting such as are left behind by previous acute inflammation, when not due to cancer or tubercle, are syphilitic, although there may be at the time no other evidence of syphilis upon the patient, and may not have been for years. For distinguishing marks of these forms of enlargement, *see* diagnostic table. There are two forms of syphilitic testis:

1. Syphilitic epididymitis.
2. Syphilitic orchitis, diffuse and gummy.

1. Syphilitic Epididymitis.—An exhaustive description of this affection was first furnished to the profession by Dron,[2] who gives a number of cases. Other authors have since described the disease. No autopsy has yet revealed its exact pathology, but an identity of lesion with other syphilitic affections of the testicle is probable. It is of rare occurrence. It comes on usually in the early months, at a mean of about three or four months after chancre, during the period of the early eruptions. Bassereau and Rollet have seen it coincide with roseola. The disease is confined to the epididymis, mainly to the globus major. The epididymis may suffer with the testicle in the later forms of syphilitic orchitis, but in this earlier form the testicle is only involved in a small proportion of cases. Lancereaux states, as a general rule, that the earlier syphilis attacks the testicle the more liable is the epididymis to suffer. This syphilitic epididymitis has been observed (very rarely) as late as several years after chancre. The disease usually involves both sides at the same time. In one such case, Dron examined the semen of a patient and found spermatozoa. This test might be of service in doubtful cases to differentiate the disease from ordinary chronic epididymitis, although in the latter it is the tail and not the head of the epididymis which is generally involved, and there has been almost invariably some urethral discharge preceding the attack. Furthermore, this syphilitic induration

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[1] The testicle, in inherited disease, also may suffer. A well-marked case has fallen under the author's observation, cured by iodide of potassium.

[2] "De l'Epididymite syphilitique," Archives Gén., Sixth Series, vol. ii., November and December, 1863.

of the globus major stands out clearly defined as a hard. tumor, entirely distinct from the testicle, and not capped over it as is usually the case in chronic epididymitis. The swelling is indolent, accompanied by an insignificant amount of pain. All reported cases have ended in resolution, it never suppurates, but declines rapidly under the appropriate treatment of early syphilitic lesions (mercurial). Rollet puts the limits of treatment necessary at from fifteen days to two months. Local means are not necessary. No functional alteration or organic lesion is left behind.

2. SYPHILITIC ORCHITIS.—This affection appears under two forms:

a. Diffuse, chronic, parenchymatous inflammation of the organ, of a peculiar sort.

b. Gummy nodules; the latter being an intensification of the former process, often accompanied by it, but of the two forms the more rare.

a. The diffuse form, like parenchymatous hepatitis, or nephritis, is an interstitial orchitis, a peculiar sort of chronic inflammation attacking the fibrous envelope and the parenchyma of the organ. Ricord named it albuginitis. The process begins by hyperæmia; young cells appear in the connective tissue of the organ, many of them developing into fibres which go on to contract. These young cells press upon, and gradually cause atrophy of, the tubular structure. The tunica albuginea becomes thickened, as does also the tunica vaginalis. More or less fluid occupies the cavity of the latter, while many adhesions commonly take place between the free surfaces. In this way the organ reaches double its natural size, perhaps more, but rarely becomes very large, unless from a considerable collection of fluid in the tunica vaginalis. Often only a portion of the gland is involved in these changes. Both testicles may be affected simultaneously, but usually consecutively. After a time the newly-formed connective tissue contracts, the septa between the lobes of seminal tubules become greatly thickened, composed of dense, fibrous tissue, showing white on section, while the clusters of tubules intervening between them, after first undergoing a brown pigmentation, become atrophied by pressure, and finally may disappear, lost in the general fibrous metamorphosis of the gland. The contraction may continue, much of the newly-formed material being absorbed, and the process going on to wasting of the organ, until only a stump is left behind. If the gland has only been partially invaded, a depression may be left marking the site of the disease. In this form there is no tendency to suppuration, ulceration, or formation of fungus. This is the slower variety of disease.

b. The gummy form, which is believed to be an intensification of the foregoing process, sometimes coexists with it. It is marked by the formation of nodules, usually multiple, which seem often to take their origin in the external tunic of a vessel, or the wall of a spermatic tubule (Lancereaux). They may be found of all sizes, from a mere point to that of an egg, and consist of an agglomeration of cells, with more or less fatty, granular matter, toughly united by fibrous elements into a lump, presenting, on section, a grayish-yellow or distinct dark-yellow color. As they get larger these nodules tend to soften at the centre. They are surrounded by a grayish areola, traversed by vessels, and later are often enveloped by a condensation of tissue somewhat resembling a capsule. These tumors may form near the surface, or deep in the gland. They may occur in the epididymis. The latter, however, usually escapes, while the vas deferens is very rarely involved. The tunica vaginalis is usually more or less distended with fluid. In gummy orchitis the testicle may acquire a very large size. The gummy tumors once formed may cease to grow, soften, degenerate, and calcify, or be entirely absorbed, leading to atrophy, perhaps, of the whole organ, or only of a portion. Again, the integument over them may ulcerate, after adhesion has taken place, and syphilitic fungus result.

The mechanism of the formation of fungus is as follows: The gummy matter infiltrates the tunica albuginea, and undergoes degeneration, causing softening of that structure, with bulging of the contents of the testicle. The superjacent skin and intervening tissues now inflame and adhere, finally ulcerating and allowing the continuous growth of gummy matter within the testis to extrude through the opening, together with the tubular structure, which may be found lying in little clusters amid the yellow material. The fungus continues to grow, the dartos and skin contract about its pedicle, and the extruded mass becomes covered with some granulation tissue, and bathed in pus. These syphilitic fungi are rather firm to the feel, painless, and do not bleed very easily. If cut off they continue to grow, or, if the disease be not arrested, the sprouting may continue until the whole tubular structure of the testis has been pushed out from the inside, after which it may wither and dry up, the testicle going into complete atrophy. The seminal tubes in the fungus retain some of their activity, as shown by the fact that spermatozoa may be found in the discharge. The fungus differs from other fungi of the testis. After injury some of the tubules may protrude as a slough, but whatever fungus there is is simple granulation, soft, bright, pink, bleeding easily. (For differential diagnosis of fungi of testicle, *see* DIAGNOSTIC TABLE.)

Symptoms.—True syphilitic orchitis, affecting the body of the testis, rarely appears until after at least a year, rarely before the third year has elapsed from the date of chancre. It may be very rarely more precocious. Ricord and Bumstead have seen it as early as the fourth or fifth month. It may coincide with iritis, with groups of tubercles, with ulcers, or deeper lesions of bone or cartilage. Not infrequently, however, it comes on long after the patient has ceased to show any evidence of specific disease. The enlargement of the testis takes place gradually and without pain. It is usually first discovered by accident, already quite large, so that the patient affirms that the swelling came on very rapidly, in a day or more. There may be, however, some slight pain at first, especially along the cord, and in the groin, with an uneasy feeling in the testicle itself. When first seen, the size of the testicle is usually not more than twice or three times as large as natural. It may be perfectly smooth, and hard as wood, the epididymis not distinguishable. Usually the body of the testis is irregular and nodular, very hard, or there may be one or more prominent lumps of gummy exudation. Only a portion of the testicle may be involved, the rest feeling natural. In such a case the healthy portion may be normally sensitive, giving, when pressed, the natural sensation of squeezing the testicle. Often, however, the swelling is wholly insensitive, and may be squeezed at will, without evoking the least uneasy feeling.

The outlines of the testicles may be obscured by a considerable collection of fluid in the tunica vaginalis. After drawing this off, the hard, nodular, uneven outline of the insensitive, syphilitic testis becomes apparent. The vas deferens is always healthy, and the scrotal tissues rarely involved, so that the hard mass can be freely moved and examined under the thin skin of the scrotum. The general health may appear excellent, but, if both testicles are involved, sexual appetite and power are almost invariably absent. There are no erections, and function is temporarily abolished. The same impairment of sexual function exists in a less degree where one gland only is involved. There may be, very rarely, a syphilitic fungus, as described above. The glands in the groin are not affected. (For differential notice, *see* Diagnostic Table.)

The duration of the disease may extend over several years. The terminations are resolution, degeneration (fibrous, fatty, calcific), atrophy.

Prognosis.—The prognosis is good. The seminal tubules do not become occluded. They only perish by degeneration and atrophy, from pressure, and some of the canaliculi have usually escaped. The sooner treatment is commenced, the better the prognosis. The gummy material melts away under appropriate measures, liberating from pressure such of the tubules as have escaped atrophy, and, with a return of the organ to its natural size, erections and sexual appetite reappear. Gosselin has found spermatozoa in the semen of patients who had had double syphilitic orchitis after the same had been cured by treatment. Relapse is always to be feared, especially if the treatment be not persisted in long enough, or if the testicle be subjected to mechanical violence when nearly cured.

Treatment.—All three forms of syphilitic testis are amenable to treatment. Early syphilitic epididymitis gets well promptly under mercury, employed as for the earlier syphilides. Of the other two forms, the purely gummy may be more promptly relieved; but, in any case, the earlier an intelligent treatment is instituted the more speedily does the disease respond. The mixed treatment is most commonly applicable—mercury and iodide of potassium; but, as a general rule, the later the attack after the chancre the more reliance is to be placed upon the iodide, and the less upon mercury. With distinct, large knobbed, gummy tumors, and always with syphilitic fungus, and in connection with other marked evidences of tertiary disease, the iodide should be used alone, carried rapidly to a high dose. (*See* TREATMENT OF SYPHILIS.) A suspensory bandage should be worn, and all hygienic means employed. Local treatment is unnecessary.

Fungus may be touched with nitrate of siver, and strapped after any constriction at its neck by the scrotal tissues has been divided; but reliance can only be placed on internal treatment, which will cause it to shrink back into its place. It is unwise to cut away any portion of it, for healthy seminal tubules may thus be sacrificed. It is needless to add that no attempt should be made to cure the accompanying hydrocele by local means. The fluid will disappear as the tesicle reduces in size (Case XXVIII.), and no injections or other local measures can cause its subsidence before that time. As often as the tunica vaginalis becomes distended a palliative puncture may be resorted to. If occasionally the hydrocele persist after the testicle has returned to a state of health, it may then be treated successfully by the ordinary methods. Sometimes a syphilitic testicle is first suspected, after the evacuation of a hydrocele, by the characteristic feel of the gland. Extirpation is not to be thought of. Before syphilitic disease of the testicle was understood, the older surgeons were in the habit of extirpating many large, chronic, indolent swellings of the organ (called sarcocele, or hydro-sarcocele), which an appropriate treatment might have restored. Sir Astley Cooper at one time gave it as a general rule that no testicle should be removed for chronic enlargement and induration until "the gums had been touched by mercury." Modern progress has altered the rule. We no longer "touch the gums," but it may now be safely laid down as a proper rule to follow, *in all cases of doubt, with enlargement of the testicle, never to operate until a thorough anti-syphilitic treatment has been tried faithfully, including large doses of the iodide of potassium.* A final caution must be given, namely, not to remit treatment too soon. It should be kept up for many months after the testicle has resumed its natural size, and only given up gradually, for fear of relapse.

CANCER OF THE TESTICLE.

Soft carcinoma is the only variety of cancer occurring primarily in the testis. Scirrhus lacks the "strict requirements of anatomical proof."[1] Pigmented cancers are said to have been seen as metastases. But even soft cancer is very rare. It does occur, however, and is found at all ages, from the cradle to the grave. Pitha saw it in a new-born infant.

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[1] Rindfleisch, *loc. cit.*, p. 351. Curling, Pitha, Foerster, Verneuil, and others, admit scirrhus. Nepveu reports a case, "Tumeurs du Testicule," Paris, 1872, p. 35.

After sixty it is very uncommon. It is met with mainly in early manhood, when the function of the testicle is most active. It rarely occurs on both sides. An injury seems sometimes to be the immediate exciting cause. Sarcomatous tumors of the testis are very liable to degenerate after a time, and become carcinomatous.

Symptoms.—Gradually, sometimes rapidly, induration and enlargement come on. The oval shape is preserved, there is only slight pain (worse on pressure throughout the disease), and there is effusion into the tunica vaginalis. As the testis grows, it becomes uneven on its surface, elastic in portions, perhaps so soft as to give the idea of true fluctuation. The pain now increases in the testicle and cord, the latter becomes engorged, the pelvic and abdominal glands, as also often the inguinal, swell and become cancerous. The tumor formed by these glands may usually be felt in the loins. There is generally constant pain in this region. Venous circulation is impeded by pressure of the cancerous masses upon the great abdominal veins, the veins of the scrotum stand out varicose and prominent, the leg becomes œdematous. The pains become intense, sharp, shooting, often burning in paroxysms, between which a constant ache is felt in the testicle and cord. The testicle during this period has been constantly growing, it has burst the bounds of the tunica albuginea involved the epididymis and cord, but the scrotum expands and the tumor may reach the size of a child's head. Boyer removed a cancerous testis weighing nine pounds.[1] During its growth it may experience periods of rest when there seems to be little or no advance made, or when it may become smaller for a time, by the absorption of some fluid portions, as of fluid in the tunica vaginalis. The pain is aggravated by pressure, and the normal feeling on pressure is absent. After a time, if death or an operation do not remove the tumor, the scrotum will adhere to it at some one or more prominent portions, the skin will ulcerate and the cancerous mass will spread to the outside, forming fungus hematodes, the true cancerous fungus. This is bathed in a thin bloody ichor, grows rapidly, portions of it slough away, and it often bleeds profusely. Meantime the general health, perfect at first, suffers proportionally with the advance of the disease, until finally well-marked cancerous cachexia is reached, attended by its usual sallowness, and tendency to waste away.

The pain so characteristic of this disease is sometimes very slight in the testicle, but particularly so in connection with the cancerous growths from the pelvic and lumbar glands, where there may be no pain at all with advanced disease (Brodie).

Pathology.—The disease commences at different points, which coalesce. It is rarely a general infiltration. On section it is impossible with the naked eye to distinguish between soft carcinoma and soft sarcoma, but the soft "medullary" sarcoma is also malignant, affects the retro-peritoneal glands, and is finally fatal. They both exhibit the same soft spots, perhaps filled with pultaceous matter, the same white or pink-white colors. The microscope shows the cancer to be a stroma, richly permeated by young cells, inclosing "epitheloid cell-aggregations" which owe their origin (Birch—Hirschfeld) to the proliferation of epithelial cells of the glandular tubuli; the medullary sarcoma, also malignant, shows a broad trabecular work of spindle-shaped cells, with often nests of epithelial cells, showing that it is partly carcinomatous, or a round-celled stroma, with elements of other histoid formations (mucous cartilaginous tissue, Rindfleisch). The large soft spaces yield a plentiful juice when pressed, and, if water be run over them, the softer parts may be washed away, leaving a delicate stroma behind. The stroma, again, may be thickened and fibrous. Cysts are not infrequently found, sometimes blood-cysts, or large blood-clots, as in kidney-cancer.

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[1] *Revue Médicale*, November, 1839.

Cancerous degeneration may have attacked a testicle already sarcomatous, when we should find, besides the conditions above described, perhaps cartilage more or less calcified, or mucous tissue, or unstriped muscle.

The enlarged abdominal glands press upon the vena cava. The cavity of the latter has been found obliterated, filled with cancer-growth; the bones of the spine become involved, while secondary cancer may be found in the kidneys, liver, and lungs. A few instances have been cited of cancer of the testicle, beginning in the tunica vaginalis. One or two cases of colloid and melanotic cancer are recorded, as well as a few of scirrhus.

Diagnosis.—In the early stages of the disease, especially if its course be slow, diagnosis is often exceedingly difficult. The diagnosis is with sarcoma, syphilis, tubercle (for which *see* DIAGNOSTIC TABLE), hydrocele, and hæmatocele, with dense walls. Hydrocele or hæmatocele may be diagnosed, if all other symptoms fail, by exploratory puncture with trocar. If a trocar be used and thrust into a soft part of a carcinomatous testicle, enough blood may escape to encourage the idea of hæmatocele, but it will be noticed that the volume of the tumor does not decrease proportionally to the amount of blood which has escaped.

Prognosis is even worse than for cancer elsewhere. Two years is a fair average duration for the disease, and the liability for secondary cancer to appear in the loins or elsewhere after operation is very great. But few cases, and they could be counted on the fingers, are reported of a continuance of health a number of years after extirpation, and in these cases the operation was always done very early, and perhaps the disease was sarcoma.

Treatment.—Medicine is of no service. Puncture of tunica vaginalis will often relieve pain immediately. A very early operation offers the only hope, but hope departs when the cord and glands become involved.

SARCOMA.

CYSTIC SARCOMA, ENCHONDROMA, MYOMA, MYXOMA.—This affection is even more rare than cancer. Its cause is unknown. It occurs most frequently between eighteen and twenty-five. It is rarely bilateral. The body of the testis is involved, the epididymis sometimes secondarily. When the morbid mass is made up largely of cysts, it is called cystic sarcoma; when there are but few cysts, and much solid matter, it has been customary to call it fibro-cystic sarcoma.

Symptoms.—The growth of sarcoma is slow, and usually painless, so that considerable size may be attained before the disease is noticed. There may exceptionally be some pain or dragging in loin, groin, or testicle, especially after the mass has become bulky. The tumor may attain a weight of several pounds. The shape is oval, and the surface smooth, unless some large-sized cysts happen to be superficial. A healthy epididymis can be felt at first distinct from the testicle; finally it is lost in the general swelling. The tumor may remain many years of a certain size, and then take on malignant degeneration, after which symptoms of cancer supervene.

Sarcoma is liable to be confounded with cancer, tubercle, syphilis (*see* DIAGNOSTIC TABLE), hydrocele, or hæmatocele, but the tumor is elastic, not fluctuating, and a trocar distinguishes it from the latter affections. Severe pressure often produces a sensation of faintness.

Pathology.—On section the tunica vaginalis and tunica albuginea are found thickened. There may be but a few cysts, or vast numbers constituting nearly the entire tumor, varying in size from a point to a pigeon's-egg. The smaller cysts contain a gelatinous fluid which gets thinner afterward, and may contain cholesterine, fatty *débris*, etc. The fluid is often colored with blood. A pure, watery serum is rare. Sometimes the fluid is synovial-like, sticky, stringy. The cyst-walls, especially the smaller, are lined by cylindrical epithelium. Papillary excrescences, covered also by cylindrical epithelium, are found growing into the larger cysts, which often become entirely filled up by them, as in cystic sarcoma of the breast, and as in the latter disease, so also in this, it is not uncommon to find in the cysts little, yellow, hard spherules of condensed epithelium.[1] As to the mass of the tumor, fibrous tissue is found in greater or less proportion, and as the tumor is nearly always a complicated one, it is not unusual to discover portions of muscular tissue (of both kinds, Senftleben, Billroth, Nepveu), masses of mucous and even of adipose tissue, and hyaline cartilage, perhaps partly calcified. This cartilage, which may be found in all sorts of curious, branched shapes, has been made out by Paget and Billroth to occupy the lymph-vessels. In Paget's case the cartilage extended up the lymphatics of the cord into the abdomen, and a mass was found growing from one of them into the vena cava. Cartilaginous nodules were found in the lungs. Where there is much cartilage there are seldom many cysts. Indeed, the tumor may consist solely of hyaline cartilage at first. This grows slowly, painlessly, and may attain the size of a hen's-egg, when, possibly after several years, a sudden, rapid enlargement of the testis sets in, and we find that the cartilage has become surrounded by recently-formed masses of sarcomatous character. Cretification may be found in the testicle and its coverings, in connection with enchondroma or sarcoma (Rindfleisch).

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[1] These little pearl-like clusters of epithelium are encountered in various pathological conditions of the testis.

A pure myoma may occur in the testicle as a solid, painless lump. Rokitansky describes one as large as a goose-egg, of striped muscular tissue; Rindfleisch another, of unstriped fibres. Sarcoma may occupy only a portion of the testis, or the whole gland; the tubular structure is then either found spread out upon the new deposit, or scattered through it. It eventually atrophies. The epididymis becomes flattened and wasted, or finally involved in the disease. According to Billroth, sarcoma commences in the sub-epithelial tissues of the seminal tubuli as a round-celled degeneration of the tunica propria, leading to occlusion of the tubule, and subsequent dilatation behind the occluded point. Commencing cancerous transformation may often be detected.

Treatment.—The only treatment is extirpation. The disease may be indeed purely benign at first, and remain so perhaps indefinitely, but it may become cancerous, and, if the individual have one good testicle left, it is unwise to put off the operation. If the patient be a monorchid, strict justice would allow delay, so long as any of the secreting structure of the testis had been spared by the disease, and continued its functions.

DIAGNOSTIC TABLE.

Since it is so difficult often to decide upon the nature of a given chronic enlargement of the testicle, it seems advisable to display the main diagnostic features of the four affections, tubercular testis, syphilitic testis, cancer, and sarcoma, side by side in tabular form, so as to bring out as clearly as possible, and emphasize, their most striking differences:

Tubercular Testis.	*Syphilitic Testis.*	*Cancer.*	*Sarcoma.*
1. Most common in early youth and manhood.	1. Most common in middle and later life.	1. Most common in youth.	1. Most common in early manhood.
2. No change in scrotal veins.	2. Same.	2. Scrotal veins enlarged and varicose after the disease has lasted some time; due to the pressure of cancerous glands above.	2. No change.
3. Does not grow to great size.	3. Is usually comparatively small.	3. May reach an immense size.	3. May become very large.

Tubercular Testis.	*Syphilitic Testis.*	*Cancer.*	*Sarcoma.*
4. Holds second place of frequency.	4. Most common of the four.	4. Holds third place.	4. Least common.
5. Primarily affects epididymis.	5. Primarily affects body of testis.	5. Same.	5. Same.
6. Form knotty, irregular, hard, especially the epididymis.	6. May be perfectly smooth and oval, or more or less lumpy.	6. Uneven; prominent hard and soft spots; indefinite fluctuation.	6. Slightly uneven, oval, perhaps with points of fluctuation.
7. Development slow.	7. Same.	7. Development rapid.	7. Very slow, often suddenly becoming rapid.
8. Pain absent or insignificant.	8. Often absolutely no pain.	8. Pain liable to be severe soon after commencement, sometimes excruciating.	8. No pain.
9. Often discovered by accident.	9. Same.	9. Recognized by pains from the start.	9. Tumor grows slowly, and is usually discovered small.
10. Usually no sensation on pressure, neither pain nor the normal sensation.	10. Same.	10. Darting, sharp, burning paroxysms and constant pains, aggravated by handling.	10. No pain; squeezing testicle often produces feeling of faintness.
11. Fluid in tunica vaginalis sometimes.	11. Fluid in tunica vaginalis nearly always.	11. Fluid in tunica vaginalis usually slight.	11. Fluid in tunica vaginalis rarely.
12. Tendency to suppurate, discharge, and leave fistula.	12. Tendency to atrophy without external opening, sometimes there are a discharge and fungus.	12. Tendency to open, and form fungus hæmatodes.	12. No tendency to open or to form fungus.
13. Both testes often consecutively attacked.	13. Same.	13. Usually only one testicle suffers.	13. Same.
14. Loss or impairment of sexual desire and power when both glands are involved.	14. Same, and more marked; sometimes exists when one gland only is diseased.	14. Both glands not involved simultaneously.	14. Same.
15. *Fungus* not very common. If found, it is pale and soft, bleeding rather easily, composed mainly of granulations. Pus thin, sinuses leading into testicle, growth slow, usually painless.	15. *Fungus* very rare. If found, it is hard, yellow, mainly composed of tubes and yellow syphilitic matter, does not bleed very easily, no sinuses, growth slow, painless.	15. *Fungus* constant if testis remains long enough, grows rapidly, bleeds profusely, sloughs readily, is covered with sanious, badly-smelling ichor, is formed mainly of cancer-tissue, is very painful.	15. No *fungus.*
16. No glandular enlargement.	16. Same.	16. Inguinal and pelvic glands involved.	16. Glands sometimes involved.

Tubercular Testis.	*Syphilitic Testis.*	*Cancer.*	*Sarcoma.*
17. Very rebellious to medical treatment.	17. If taken early, quickly amenable to treatment. In any case always reducible in size, by intelligent medication, to which all doubtful cases should be subjected, to give them a chance.	17. Treatment ineffective. If cut out, returns elsewhere.	17. Medical treatment ineffective. If cut out, disease does not necessarily reappear; if left, cancerous degenerations may occur.
18. Cord always affected eventually.	18. Cord never involved in a pure case.	18. Cord affected in advanced disease.	18. Cord never affected.
19. Vesiculæ seminales liable to become involved.	19. Nothing of the sort.	19. Nothing.	19. Nothing.
20. Feel lumpy.	20. Excessively hard.	20. Hard and soft.	20. Elastic.
21. Duration, several years.	21. Duration, several years—usually less than tubercle.	21. Duration, average two years.	21. Duration, many years.
22. Prognosis not favorable. Progress always indolent, entire cure rare.	22. Prognosis good; gets well, with functions restored if treated; atrophies if not treated.	22. Prognosis bad; kills by bleeding or cachexia if not removed; by return of the disease if extirpated.	22. Prognosis good. Does not return if removed. If left, liable to become cancerous.

CASTRATION.

This is an operation not very often required since sarcocele (as any chronic fleshy enlargement of the testis used to be called) has been more closely studied and better understood. Still there are occasions when it is proper to remove the testicle. The operation is a simple one, and is best performed as follows: The pubes, perinæum, and scrotum, are first shaved, and any complication in the way of hernia is excluded if possible. An anæsthetic should always be administered.

An incision is made, commencing a little below the external abdominal ring, and carried to the bottom of the scrotum along its anterior aspect. Even if such a length of incision were not required by the size of the gland to be removed, yet it is better to make it long, so that the lower angle may be depending, and thus to allow a free exit for the discharges. The spermatic cord is next exposed, and, if it must be ligated very high up, it is better at once to put a stout ligature around it, and to tie the whole cord quickly and firmly. If enough of the cord is left to be seized, it may be held by the fingers of an assistant, but care must be taken not to let it slip, or it will disappear within the inguinal canal and a great deal of hæmorrhage may occur before it can be recovered by dissection. The cord being cut, the testicle is to be turned out more by tearing than by cutting. An oval piece of skin may be removed with it if it is very large, and, if it adheres pretty tightly, care may be required to prevent wounding the urethra or the other testicle during the dissection. After the testicle is removed, the arteries of the cord (the spermatic, deferential, and the cremasteric) should be tied, and all the bleeding points in the scrotum secured. If a single ligature has been used for the whole cord tied high up, it may be left, and usually no bad symptoms will occur. Pain, however (and even tetanus), has been said to be produced in this way from including the nerves of the cord and the vas deferens in the ligature. The wound should not be united until all the bleeding points have been secured. There are few operations in surgery which are so liable to be complicated by troublesome bleeding after the wound is closed. This is due to the laxity of scrotal tissue.

If hernia complicates the disease of the testis, care should be taken not to open into the peritoneal cavity. If the cord should slip into the inguinal canal after being divided, the tendon of the external oblique must be cut at the external pillar of the ring, and the dissection continued up the canal until the cut end is reached and all its bleeding points secured. Several instances of death are recorded from neglect of this precaution. If hæmorrhage comes on after the wound has been closed, it should be reopened and the bleeding vessels searched for. A few points of suture are necessary, otherwise the edges of the wound will be kept gaping by the contractions of the dartos. Some strips of adhesive plaster, a tent at the lower angle of the wound, and a T-bandage, complete the dressing. Self-castration has often been resorted to by lunatics, or by individuals, usually young men, laboring under some depression brought on by masturbation or other abuse of the organs. The bleeding is always excessive, but, in the cases reported, has usually been successfully arrested.

DERMOID CYSTS OF THE TESTIS.

The testicle, next to the ovary, is the most favorite site for the development of dermoid cysts. These cysts are cavities lined by integument, furnished with stunted papillæ, sebaceous and hair glands. Their contents are a sebaceous matter mixed with epithelium and rolls of long hair, usually reddish. Besides these there are often found fully-formed teeth, sometimes in great numbers, often embedded in portions of bone, bones with smaller bones articulated to them, cartilage, muscle, nerve.

Case XXXVIII.—In a personal case a dermoid cyst was taken from a boy who had been allowed to carry it for years, under the impression that it was cancerous. It was found to contain a portion of well-formed inferior maxillary bone, with several molars and a bicuspid tooth firmly fixed in it. Recovery followed.

These cysts may be within or outside the testis, as in Velpeau's case.[1] These are the cysts sometimes known as fœtal inclusions.

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[1] *Gaz. Méd. de Paris*, February 15, 1840. André, "Mém. de l'Acad. Royale de Méd.,"

Modern pathologists combat the views of Geoffroy St.-Hilaire on this subject, and the more poetical theory of fœtal inclusion is rapidly giving place to the common-sense one of simple, accidental, misplaced, formative activity. The cysts are probably always congenital. They usually grow very slowly at first, but may reach an inconvenient size in time. Generally they become very large, then suddenly begin to grow rapidly and are removed, or, becoming injured by a blow, they inflame, suppurate, and discharge their contents, remaining fistulous.

The only treatment is removal with the knife. It should be remembered that the cyst sometimes lies outside the testicle, the latter adhering to it. The gland should be dissected off, and spared if possible.

IRRITABLE TESTIS.

This is a name given to a species of neuralgia of the gland. The whole organ, or usually a particular spot, is extraordinarily sensitive to the lightest touch; contact of the clothing alone is sometimes exquisitely painful. In the recumbent posture, with nothing in contact with the testicle, the pain usually disappears. Sometimes the organ is tense and engorged; but it is of full size, and seemingly normal. Again, it may be decidedly flabby, the scrotal tissues being soft and lax. Irritable testis occurs at all times, from early puberty to late middle life. It is met with chiefly in old bachelors and widowers. The patient otherwise may possess robust health, sometimes (especially with flabby testis) he is anæmic, nervous, hypochondriacal, and dyspeptic.

The causes of irritable testis are lack of use, or abuse, of the sexual powers—perhaps most often ungratified sexual desire. Curling says,[1] "In a person of chaste habits, thus affected, I was informed that the morbid sensibility disappeared on marriage." Temporary irritable testis may be produced in a healthy person, at any time, by prolonged sexual excitement ungratified. Masturbators, who have suddenly reformed, and recent widowers, and those who have abused their sexual powers by over-use, are all liable to the affection under consideration.

These patients are usually hypochondriacal, look upon their own condition as a pitiable one, and ascribe it to loss of seminal fluid—perhaps to nocturnal emissions—to neither of which does it stand in any relation of effect. They often demand castration—a demand which should be acceded to on no account. Curling quotes from Romberg an interesting case bearing on this point: A young man acquired irritable testis after becoming engaged to be married. It distressed him so seriously that he demanded extirpation of the organ, and would not yield until at last the operation was reluctantly performed. Eight days afterward the old pain returned in the other testicle. This being all he had

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vol. iii. Ollivier (d'Angers), "Mém. sur la Monstrosité par Inclusion," Archiv. Gén., vol. xv. Verneuil, "Archiv. Gén.," June, 1855, who has collated nine cases besides one of his own.

[1] "On the Testis."

eft, the patient preferred to keep it. He married, and "very soon recovered completely."

Treatment.—Hygiene, physical, moral, and sexual, is the proper treatment for irritable testis. As local means, a suspensory bandage and the cold douche are adjuncts. Drugs exert no specific power and cannot be relied upon. Marriage, with a proper sexual hygiene, is the natural antidote to any irritability of the sexual apparatus.

NEURALGIA OF THE TESTICLE.

An extreme degree of the condition just detailed constitutes neuralgia of the testicle, a disease which sometimes attains horrible intensity, and assumes the tic-douloureux type in paroxysms at irregular (occasionally regular) intervals. The pain in some cases is constant, and perhaps quite mild, but increased by walking and standing so as to occasion great discomfort. The character of the pain is acute, darting, stabbing, sometimes dragging, heavy. The cremaster sometimes contracts spasmodically during the paroxysm, forcibly retracting the testicle, and a cold sweat, with nausea and vomiting, is not a rare accompaniment. Between the paroxysms the testicle is often entirely free from pain. Handling the organ is liable to induce a paroxysm. The testis, sometimes swollen and tense, is usually unaltered. There is no febrile action. Neuralgia is usually confined to one testicle, unlike irritability, which is frequently double. Neuralgia must not be confounded with the sympathetic pain in the testis, and its retraction from spasm of the cremaster, accompanying certain morbid states of the bladder, ureter, and kidneys, and so often seen in kidney-colic.

The cause of neuralgia of the testis is sometimes difficult of appreciation. It is often due to the same general influences which lead to the development of neuralgia elsewhere (gout, syphilis, malaria, etc.). It sometimes follows an attack of orchitis. It has been vaguely referred to the spinal cord, deranged digestion, etc. It has been seen to follow injury, and to attend a small, deep-seated, purulent collection. B. Brodie[1] found it in one case always preceded by clay-colored evacuations and pain in the back of the head. He believed the cause in this case was situated in the liver. In another case, he found a small projection on the epididymis, which, on pressure, gave the sensation of touching an exposed nerve in a tooth. The following is an analogous case:

CASE XXXIX.—A middle-aged healthy gentleman married to a sickly wife, with whom he had only occasional sexual relations, applied for treatment of a painful spot on the left epididymis, which could be felt as a little lump not larger than half a grain of rice, and which gave, when touched, the sensation of pressing upon an exposed nerve in a tooth. He had also "irritable bladder," depending on neuralgia of the vesical neck. There was no stricture. The systematic regular passage of a full-sized steel sound, during several months, cured both the irritability of the bladder and the neuralgia of the testis. The little lump (probably a cyst) remained, but its sensitiveness on handling disappeared gradually as the bladder-symptoms got well.

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[1] *Medical Gazette*, vol. xiii., p. 621.

In neuralgia of the testis no nerve-lesion has been found. Sexual hygiene will be often found at fault. The affection may last for years and (possibly) then disappear spontaneously.

Treatment.—Neuralgia depending on bladder, urethral, or kidney disease, disappears with its cause. In true neuralgia, a strict hygiene is all-important; this involves marriage. Among drugs, arsenic, quinine, and iron, bear the best reputation internally; belladonna, opium, and aconite, externally. But little reliance can be placed on them, however; sexual and general hygiene outrank all remedies. If the testicle be extirpated, there is always danger of a return of the pain in the cord, or in the other gland. Diday[1] recently very strongly advocates the continued application of cold in all pure cases of neuralgia, and claims remarkable success with this agent. His method consists in filling two bladders with large pieces of ice. One of these he places upon towels, so arranged as to underlie and support the testis, the patient being supine. The other bag is now placed upon the testis, so that the whole organ is surrounded by ice, or, rather, iced-water. This application is kept up night and day, for two to four days, after which (Diday states) the neuralgia does not return.[2]

CHAPTER XXVI.

MALADIES INVOLVING THE GENITAL FUNCTION.

Impotence.—True Impotence, its Causes and Treatment.—False Impotence, its Causes and Treatment.—Sterility.—Masturbation.—Pollution, Nocturnal and Diurnal.—Spermatorrhœa.—Erotomania.—Satyriasis.—Priapism.—Aspermatism.

IMPOTENCE is a symptom, usually, of some physical morbid condition entailing inability to accomplish the sexual act. Its causes are very numerous. Most of them have been already considered; the others will receive a few words of detail in this chapter. Impotence will only be considered as affecting the male.

Impotence, from whatever cause, is a complaint not unfrequently submitted to the surgeon; not always frankly and openly as such, but often by implication, as though it should be recognized and inquired about, in answer to remote indications which the patient has scantily furnished. Indeed, the surgeon who would meet the daily wants of his fellow-men, in reference to troubles of this sort, must possess an accurate knowledge of the physiology of the sexual function, and of its various derangements, and be ready to anticipate the reticence of patients; otherwise he will fail to sound many of the depths of human nature, where suffering lurks—which suffering is for the most part preventable or relievable.

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[1] "Annales de Derm. et de Syph.," 1869, No. 3, p. 182.

[2] In weak subjects the possibility of sphacelus of the skin, or of at least impairing the vitality of the parts by a too rapid reaction on removal of the cold, should not be lost sight of, although these points are not mentioned by the high authority who suggests the practice.

Impotence signifies that an individual cannot beget children because he cannot perform the sexual act properly, no matter what the obstacle may be, whether he have spermatozoa or not. The term must be carefully distinguished from sterility, which signifies inability to beget offspring on account of defect in the semen, whether the individual can have sexual intercourse properly or not. The two are undoubtedly often associated in the same individual, but they may be totally distinct, as the following examples will illustrate. Thus there are two methods of making eunuchs in the East: by one the penis is removed as well as the testicles, and such a eunuch is necessarily both impotent and sterile. By the other method the testicles alone are removed; and a eunuch of this description, though sterile (having no spermatozoa), may be still partly potent, and does not bring so high a price as another eunuch who has no penis. It is a well-known fact that both animals and men, from whom the testicles have been removed after puberty, still retain sexual desires, and may have intercourse, with venereal orgasm and ejaculation of prostatic mucus, occasionally during a period of several years. A cryptorchid is rarely at all impotent, but is very apt to be sterile, and so of a patient with double gonorrhœal epididymitis; while, as instances of impotence without any sterility, may be mentioned, deformities preventing sexual intercourse, where the spermatic fluid is normal (extrophy of the bladder), extreme incurvation of the penis, with or without hypospadias, aspermatism.

The distinction between impotence and sterility being now plain, a few words regarding each of these complaints will perhaps serve to clear them of the mists of uncertainty which often surround them.

Impotence may be considered as true and false.

TRUE IMPOTENCE.

This is exceedingly rare in the male. Any one who can perform the sexual act is potent. This act imperatively involves two conditions, namely, sufficient erection to make intromission possible, and a mucous fluid leaving the body by ejaculation. Roubaud[1] has added two other factors as essential to the act of copulation; namely, the existence of venereal desire and pleasure in the act; and although both of these undoubtedly exist in a state of health, nevertheless the absence of either of them by no means necessitates impotence, while the absence of either of the first-named conditions is impotence. An illustration of these points will bring out all that can be said practically concerning true impotence.

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[1] "De l'Impuissance et de la Stérilité," Paris, 1872, second edition.

That lack of desire before the act, and pleasure during its accomplishment, are not absolute essentials to sexual intercourse, is shown by the two conditions, priapism from cantharides, in which there is no desire, and yet intercourse is possible with perfect intromission and ejaculation, and certain diseases of the cord attended by more or less paraplegia, where intercourse may take place, followed by conception, and yet there be no pleasure in the act of ejaculation, the patient being unconscious at what moment it occurs.

CONDITIONS INVOLVING TRUE IMPOTENCE:

1. Absence of penis, as in the cases already referred to (p. 5).[1] In these cases, if there are healthy testicles, the patient cannot be called sterile.

2. Minute size of penis may involve impotence, as in Roubaud's case of a student whose penis was so small that, although he could practise masturbation, he was not able to reach the stage of ejaculation during sexual intercourse, on account of the minute size of his penis, between which and the vaginal walls there was little or no friction. Roubaud[2] rendered this man potent, and, he says, greatly increased the size of his penis by fitting him with an artificial one, into a depression in which his own would fit, and directing a series of copulative acts, anointing the penis, etc.

That small size is only relatively a cause of impotence is evident, and that it by no means involves sterility is shown by Orfila,[3] in a case where an action for rape was brought against a man with only the stump of a glans in place of the full penis, by a woman who was impregnated by him. Orfila decides that impregnation may take place under these circumstances, but only through the consent of the woman, and that rape is consequently impossible. The numerous cases on record where impregnation has taken place without rupture of the hymen shows that a deposit of semen within the ostium vaginæ may fertilize an ovum, and such a deposit of semen *might* be accomplished by the smallest possible penis. Intromission and ejaculation might take place, and impotence, though possible (as in Roubaud's case), is not necessary. The patient is not sterile.

3. Extreme size of the penis is a (relative) cause of impotence Under the same head might be ranged double penis, with common cutaneous sheath (Case I.).

4. Extreme epispadias and hypospadias, with or without extreme incurvation (p. 38), involve impotence, without sterility. Extrophy of the bladder the same; and, although, as in Huguier's[4] case; copulation might

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[1] A case has been encountered by the authors.

[2] *Op. cit.*, p. 160.

[3] "Médecine légale," vol. i., pp. 177, 178.

[4] *Gaz. des Hôp.*, 1840, p. 467

be possible with extrophy, yet intromission of semen would not take place, and impotence would be inevitable. The female with extrophy is neither impotent nor sterile. Slight hypospadias may, but does not necessarily, involve impotence. The semen is not properly ejaculated into the upper part of the vagina, and impregnation sometimes fails to take place—through the fault of the male. A very short frenum may act in the same way as slight hypospadias.

5. Large size of the prepuce, excessively tight and narrow orifice of the same, may involve impotence, as may also any tumors or growths upon or about the penis, elephantiasis, fatty tumor, hydrocele—or neighboring deformity, as faulty position of the thigh from anchylosis of hip, excess of abdominal fat, etc., all of which may mechanically interfere with copulation without in the least implying sterility.

6. Very tight stricture of the urethra, especially if there be large and multiple fistulæ behind it, may involve impotence. The semen does not escape by ejaculation, but dribbles away after erection subsides. A similar cause of impotence exists in a vicious direction of the orifices of the ejaculatory ducts, by which the semen, during ejaculation, is turned backward into the bladder, and escapes afterward with the urine, as in Peyronie's case,[1] or from prostatic disease. According to Grimaud de Caux,[2] such a condition of things may be caused by the action of a certain class of Parisian prostitutes, who, fearing pregnancy, watch for the moment of ejaculation, and then press forcibly upon the urethra of their partner just in front of the prostate, by inserting a finger into his rectum. By this means the veru montanum, the natural dam to prevent reflux of semen into the bladder, is forcibly turned backward, and finally, by a repetition of the act, assumes a fixed, faulty position, and the individual remains impotent, ejaculating his semen into his own bladder.

7. The peculiar affection called *aspermatism* is impotence. The patient is not sterile; his copulation is perfect, except ejaculation.

8. Imperfect, irregular, bent erections, due to inflammation of (p. 24) or deposits of various kinds in the sheaths or substance of one of the erectile cylinders of the penis, may sometimes be extreme enough to prevent intromission, and entail impotence.

9. Eunuchs, and patients having atrophy of both testicles, are usually impotent, always sterile.

10. Planque[3] mentions a case where a blow on the head was followed by permanent loss of erection. The same may follow prolonged spermatorrhœa, or excessive and continued masturbation.

11. Impotence may be *symptomatic*—not to speak of the physiological impotence of childhood and old age—and then is only conditional or temporary, and disappears usually with the removal of the cause. Im

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[1] Quoted by Orfila, "Traité de Méd. légale," fourth edition, vol. i., p. 186.

[2] "Physiologie de l'Espèce," Paris, 1847, p. 367.

[3] "Bibliothèque choisie de Médecine."

potence depending upon most of the conditions already enumerated is, critically speaking, symptomatic, such as impotence from local deformity or overgrowth, or obesity, or stricture; but the term "symptomatic" is used to make a class apart from idiopathic impotence, in both of which the entire sexual tract and the penis are seemingly in good condition. A single example will illustrate the point: A. has double syphilitic orchitis; has no desire, no erections, has, in short, impotence symptomatic of syphilis. Prompt treatment is employed; his testicles return to a normal state, his erections reappear, and he is well. B. has the same condition of the testicles, the same impotence, but he employs no treatment; both testicles go on to atrophy, and he passes from a condition of symptomatic into one of true impotence, with sterility as well.

In symptomatic impotence there is always lack of erection, and often also temporary sterility. Under the head of impotence symptomatic of intoxication, Roubaud mentions, as causes, hashish, camphor, iodine, antimony, arsenic, lead; and, although some of these have some influence over the sexual function, it is well not to over-estimate their power. The supposed efficiency of iodine in producing atrophy of the testicle is largely hypothetical, and evidently based, to a great extent, upon the influence of iodine over syphilitic enlargement of the testicle, and the coincidence of atrophy of the same after an inefficient course of iodine.

Symptomatic impotence, broadly considered, is found in connection with all acute (general) febrile diseases, more or less marked with all cachexiæ, in connection with any advanced condition of disease of the testicle, especially with syphilitic testis, often depending on syphilis, without any appreciable affection of the testicle. It is encountered with severe varicocele and neuralgia of the testis, with bad cases of spermatorrhœa, and as a result of the lack of tone of the genitals, produced by long-continued excess—especially by masturbation—with severe diabetes and other advanced devitalizing diseases. Roubaud relates an exceedingly interesting case of symptomatic impotence, where a patient applied to him with large double hydrocele, and was entirely impotent. Roubaud supposed that the continued pressure of the hydroceles had caused atrophy of the testes. He punctured on both sides. The patient recovered his potence, and impregnated his wife. He lost power again when the sacs refilled. The testicles were not atrophied.

12. Finally, impotence may come on without assignable cause; but there are certain well-recognized causes which, acting upon certain subjects, are capable of producing impotence, more or less prolonged. Partial erection, attended by rapid ejaculation, is a not uncommon variety of impotence, due usually to continence, over-excitement, etc., and observed in animals as well as in men. In such cases also there will be found, not infrequently, a neuralgic condition of the prostatic sinus, and the treatment usually most effective is that of neuralgia of the vesi-

cal neck, with, perhaps, the use of tannin, with the cupped sound, local external applications of cold water, and general hygienic measures. These means, aided by the confidence with which a physician should inspire his patient, and the counsel to be deliberate in the sexual act, and to practise it in the early morning rather than the evening; or even to trust to a second effort, rather than place all hope upon the first, will usually overcome this variety of impotence. Circumcision may sometimes be necessary to diminish the sensitiveness of the glans penis, which is often over-acute.

FALSE IMPOTENCE.

False impotence is an affection which the practical physician is often called upon to treat. True impotence involves the treatment of the physical irregularity, deformity, disease, cachexia, etc., giving rise to it. False impotence requires a treatment of the individual, and not of any disease. In false impotence the cause is always nervous, or, it may be, a moral one; and there is often no impotence at all, except in the mind of the individual. Here the surgeon requires all his delicacy, all his sympathy, in order to obtain the confidence of his patient, overcome his suspicions, and gently lead him to a cure, which is always possible, if only the patient have faith.

Among the causes of false impotence may be mentioned sexual indifference, either temporary and spontaneous or more or less prolonged, as a result of sudden shock, grief, excessive joy, fright, repugnance, lack of affection for the individual with whom copulation is attempted. Under the two latter circumstances, the patient will sometimes think of another person than the one with whom he is lying, and thus maintain erection and effect ejaculation. The sudden flooding of the vagina with warm mucus will sometimes cause erection to cease at once. Drunkenness, which is not habitual, may induce temporary impotence. Roubaud mentions a curious case where impotence came on with an indigestion, and remained long after its cause had disappeared. He speaks[1] of another man who became impotent on drawing a prize of thirty thousand francs in a lottery.

Another curious case of false impotence is related by the same author:[2] A young man brought up in the country was, at the age of fourteen, initiated into the mysteries of Venus by a young friend of the family, twenty-one years old. Her hair was light, and worn in curls, and, for precaution's sake, she never had intercourse with the boy except when dressed—that is, wearing a corset, high boots, and a silk dress. The boy yielded for the sake of pleasure, but had no affection for the lady. She was passionate, and drew largely upon his young powers during four years, after which he went to the military school. On entering garrison, he found that he had full sexual powers, but that they were aroused only by certain women, and under certain circumstances. A dark beauty had no power over him, and a night-dress extinguished all his fire. In short, he found himself utterly impotent except in the company of a light-haired woman, wearing curls, with high boots, a corset, and a silk dress.

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[1] *Op. cit.*, p. 186.

[2] *Op. cit.*, p. 439.

This false impotence had a powerful hold over him. Twenty-five years after having left his seducer it was still upon him, and that, too, in spite of his having meantime fallen desperately in love with a brunette, to whom he was afraid to offer himself on account of his incapacity "d'exercer le coït dans le négligé de la couche conjugale."

In this case, the exercise of tact, aided by an aphrodisiac potion of cantharides and phosphorus, in time effected a complete cure.

An equally instructive case, illustrative of false impotence, occurring in the practice of Peirilhe, is related by Grimaud de Caux,[1] of a celebrated mathematician, who married a young and beautiful woman, whom he loved tenderly. He felt the power of her charms, and could commence the sexual act creditably, but, although they both ardently desired a child, before the moment of ejaculation arrived, the thoughts of the philosopher would unconsciously stray toward some favorite and engrossing mathematical problem, and erection would fail. A cure—at least to the extent of making Mr. —— father to several fine children—was effected by instructing his wife to get her husband partially intoxicated before accepting his approaches—the success of the expedient establishing the truth of the old adage:

> "Sine Cerere et Baccho friget Venus."

Treatment.—This form of moral impotence requires special attention to all the agencies which may be active as causes, and the exercise of patient tact, and often of sympathy to acquire and retain the patient's confidence, a point of treatment most essential to success. The surrounding hygienic conditions must be made favorable, the advantages derived from change employed, all indications of deviation from health in any respect appropriately met. It is necessary to arouse the moral sentiment of carnal desire, as well as the power of the organs, locally, to respond. The first is attained by favorable relations to the sex—opera, theatre, etc. The second, by general dry frictions of the whole body, by massage and flesh-brush; cold-bath; sea-bathing; generous diet, and the internal use of tonic medication; the mineral acids, strychnine, ergot, and especially phosphorus and cantharides, or the two combined, commencing at a fair dose, one-fortieth of a grain of the former to ten drops of the tincture of the latter, three or four hours before the desired erection, and increasing the dose carefully. Cantharides produces erection without desire; phosphorus is apt to increase desire directly. Cold and heat, by the douche, electricity, and local applications of mustard, are sometimes serviceable in recalling erection. In one case of syphilitic impotence, decided advantage was derived from the use of a quack-treatment, by an instrument called the equalizer, a large cell, in which the patient sits with his head out, and from which the air is exhausted. (A modification of the *ventouse énorme* of the French.)

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[1] *Op. cit.*, p. 341.

Nervous impotence, the most common form of false impotence, encountered frequently in young men, remains yet to be described. The patient is young and usually healthy. He has generally masturbated more or less, and has nocturnal pollutions. He has usually plentiful evidences of virile power. He has desires, which are sometimes excessive. He awakes with erections. He can provoke erection, or even emission, at will; but, in presence of a woman, and when he desires to have sexual intercourse, his organs will not respond; or, if erection comes on, it lacks full energy, and is liable to fail at any moment during the act. In short, the patient can do any thing he wishes, except that he cannot rely upon an erection at the critical moment.

This form of impotence is the result of unnatural excitement of the sexual functions. It may come from protracted chastity, ungratified desire, or excessive erotic excitement at the moment. It is not infrequently accompanied by involuntary emissions during sleep, and by the occasional escape from the urethra at any time of a semi-transparent, viscid fluid furnished by the urethra and prostatic follicles. The most persistent and obstinate mental dejection usually accompanies this form of impotence. Under the pressure of imperious desire, and after prolonged chastity, the sufferer has probably approached some incongruous female, and at the portals of success his erection has failed him. The mental depression following an experience of this sort is of the most exaggerated nature, the existence of impotence is considered as demonstrated beyond cavil, and hope is obstinately banished from the horizon. The seminal fluid, it is assumed, is escaping in the urethral discharges, and with it manhood and vitality. These ideas are intensified by the cunningly conceived advertisements of charlatans, with which the swarming newspapers abound, and the patient is still further enveloped by them in despair. False promises of cure often tempt him to a trial, and their failure relegates him to the surgeon sooner or later, more than ever deeply despondent. Such cases, which are unhappily not rare, require for their management all the ability and tact that can be brought to bear upon them.

Treatment.—The best treatment for a man with nervous impotence (who invariably awakes sooner or later with an erection) is to patiently instruct him in sexual physiology and hygiene, acquire his confidence by sympathy, and get him married, with the advice to attempt no intercourse, to be entirely frank and honest with his wife (who will more than equal him in timidity and ignorance), and, awaiting some morning when awaking with a vigorous erection, to accomplish coïtus promptly, without delay or dalliance, as a matter of imperious duty. The act once accomplished, the charm is broken. The use of the steel sound and of local applications of tannin, with the cupped sound (p. 451), often of decided service where ejaculation is too rapid, is also sometimes useful here.

STERILITY.

The consideration of sterility is so interwoven with that of impotence, that but little remains to be said. Sterility is an inability to beget children, on account of absence or imperfection of the semen, and in many such cases there is impotence as well. All eunuchs are sterile; when both testicles are degenerated or destroyed by disease or atrophy, or retained as in cryptorchids, (usually), sterility results. In two special conditions there is sterility without impotence, namely, obliteration of the canal of the epididymis, after double gonorrhœal epididymitis, and obliteration of the orifices of the ejaculatory ducts, after stone or operations, from cauterization of the prostatic urethra with solid nitrate of silver, after the process of Lallemand. Of the latter we see and hear little in this country at the present day, but, according to Grimaud de Caux, in his time the instrument of Lallemand made more eunuchs than did the demands of the harems of the East. Whenever the seminal duct is occluded on both sides at any part of its course, sterility is the natural result, since the spermatozoa cannot reach the urethra, but, under these circumstances, if the testicles are healthy, the patient is fully potent, his desire, his erection, his ejaculation, his pleasure, are normal; his ejaculated fluid resembles semen in every respect except that it contains no seminal element.

The relief of sterility depends upon its cause, which often cannot be directly reached by treatment.

SELF-ABUSE.

Self-abuse is the production of the venereal orgasm upon one's self. The term masturbation signifies that an orgasm is produced by means of friction with the hand, as it most commonly is. Masturbation is not a malady. It does not necessarily produce disease, unless it is carried to excess. The practice of it is not confined to man. Monkeys are often masturbators, bears have the same habit, goats, making use of the mouth, indulge in it, turkeys sometimes practise it upon a round object, like a smooth stone. In the human being it is practised by both sexes, at all ages. Females are much less given to it than males. The majority of women have very little passion, and suffer the approaches of a lover or husband largely as a matter of complaisance. There are undoubtedly numerous exceptions to this rule, but still a rule it is that the female, naturally modest, retiring, refined, learns what passion is only as the result of education after marriage. With the male it is different. His passion is natural. He often has erections while yet a child, and sexual yearnings long before puberty. Planque[1] mentions two children four years old whose sexual organs were so developed that they could perform sexual intercourse. Rarely does a boy escape an initiation into forbidden pleasures by his school-fellows, or his elders, and, when he escapes these, he is still very apt, when handling himself during erection, to find the sensation agreeable, and go on, really ignorant of what he is doing, until he becomes a confirmed masturbator. Male babies are sometimes handled by their nurses to keep them quiet, a practice which is certain to beget the habit, even in the earliest years of life. Stone in the bladder, irritation of the prepuce from retained smegma, traumatic stricture and bladder-disease, ascarides, etc., lead a child to handle himself, and inevitably end in masturbation, if long enough continued; indeed, there are so many causes, natural and unnatural, why a boy should masturbate, that probably few escape. The most common incentive, however, is undoubtedly instruction, and this is usually received by children from other boys at school.

It may be safely assumed that a large proportion of mankind have at some period of life masturbated more or less, and it is equally safe to assert that at least ninety per cent. of such masturbators are not physically injured by the habit. Sexual indulgence in the natural way will produce evil effects if carried to excess, yet it is probable that sexual intercourse is not only harmless, but even beneficial in moderation, when carried on naturally—as it can be only in the married state (p. 40). It is not the loss of seminal fluid which is of the first importance in producing disease from sexual excess, but the nervous shock of the oft-repeated orgasm. Babies and young children lose no seminal fluid, women have none to lose, yet, in all of these, evil results follow excess, as certainly as they do in the male after puberty. It is probable that any succession of nervous shocks as sharp and decisive as the sexual orgasm, even although they were purely intellectual, such as joy or fear, would shatter the vitality and nervous tone of an individual, perhaps as much as masturbation. Such writers as Lallemand, Acton, Belliol, certainly make too much of the solitary vice, while quacks find here the largest and most lucrative field for their nostrums. The latter scatter their books and circulars broadcast over the land, and often, under alluring titles, thrust them within the eager grasp of the young, the inexperienced, the hypochondriacal, of the nervous, overworked, unmarried youth, whose sexual needs, stimulated by his impure thoughts, do not find adequate relief. Here their tenets find ample faith and ready acceptance, and errors are implanted in the ingenuous mind which years of sober after-thought and experience, aided by the surgeon's careful and conscientious advice, are scarcely able to eradicate. Self-abuse is not confined to youth; middle and old age are not free from it.

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[1] *Op. cit.*, Art. "Accroisement."

The numerous foreign bodies found in the urethra and bladder attest the tendency that men of all ages have to meddle with their genitals. Dr. J. R. Wood, of New York, has a long, thick, leather thong which he was called upon to remove from a patient, who had introduced it through his urethra into his bladder, and amused himself by working it backward and forward until the free end in the bladder became knotted, and Dr. Wood was called upon to extract it, finding the patient with several inches of the thong projecting from his meatus.

The use of tobacco, alcohol, and, it might be added, tea, is as widespread as is the habit of masturbation; and each of these habits, or certainly the first two, inflict as much injury upon the human race as, in all probability, does the secret vice; yet who would affirm that every man who smoked would have headache, dyspepsia, heartburn, neuralgia, intermission of the heart-beat, etc., would become thin, depressed, nervous, sleepless—effects all of which may be produced by an excess of tobacco; or that another who drank liquor would necessarily have delirium tremens, cirrhosis of the liver, fatty kidney, and die with ascites and Bright's disease? As it is with whiskey and tobacco, so is it with masturbation carried to excess. It is capable of producing, it must be recognized, the most serious results, among which idiocy, insanity, epilepsy, dementia, physical prostration, hypochondria, impotence, and sterility, are prominent, but these are practically very rare—so rare, indeed, that they are encountered, as a rule, only by the specialist, and very rarely by him; and, finally, even when these serious results can be traced to masturbation as a first cause, it will often be found that some other cause has acted in conjunction with the masturbation, such as a blow on the head, hereditary tendency to the disease in question, natural feebleness of nervous tone, irregular and self-indulgent habits, abuse of stimulants, syphilis. Hence it becomes plain that, while the intelligent physician must recognize the possible physical evils produced by masturbation, he should oppose himself boldly to that sickly sentimentality which shrouds in mystery one of the failings of our physical nature, because it involves the sexual function, and should try to look the subject honestly in the face, and handle it as if it were a problem in mathematics.

Looking at masturbation in this way, the truth is, that the majority of mankind who indulge in it do so just before and after puberty. Most of them are ignorant at first that they are harming themselves, but they soon find it out by one means or another, and then sooner or later give it up. The longer and the more frequently they yield to the vicious habit the stronger does its hold become, so that in case they escape the mental and physical disorders to which excessive venery in extreme cases may give rise, still they may pay the penalty of excess by some diminution of vigor in after-life, by throwing confusion into their sexual hygiene, and establishing sexual necessities which they find it difficult to meet suitably; and, finally, they may continue on through life victims to a perverted sexual sense, shunning women, from whom they aver that they derive no pleasure, totally wrecked as to their *morale*, often hypochondriacs, and suffering from all sorts of functional distress, physical and intellectual, real and fancied.

The chief reason why so much is said of venereal excess by masturbation, and so little of sexual excess, in the natural way, is, that the former is so much more common, and not that the act itself is physically more harmful. The solitary vice, as it is aptly styled, may be practised on all occasions, even in company, by the hand in the pocket, or by friction against some prominent object. In schools, not infrequently, boys practise it upon each other; but, generally, masturbation is performed in bed, and in solitary places, where there is no possibility of disturbance. Hence the frequency of its performance is, in some cases, very great, and the effects of often-repeated nervous shock more pronounced. Sexual intercourse, on the other hand, requires the consent of two individuals, and opportunities which, relatively, are hard to find. Moreover, a man's moral sense will often keep him from committing excess with a woman, when nothing will restrain him while alone. In married life, excess is the exception; sexual hygiene is more apt to be correct, man is in his natural condition, other emotions enter largely into his daily life, and it is rare that the surgeon encounters in his practice a man happily married complaining of any disorder of the genito-urinary system, except those of a purely physical nature.

Symptoms of Masturbation.—A young child, who has been taught to masturbate, will be seen constantly at work at his genitals, and observed to have erections with unnatural frequency. No further signs are needed. Such children become fretful, peevish, thin, nervous, excitable. They sleep badly, have a haggard look, seem to be prone to convulsions, and, it is said, are apt to have epilepsy.

Boys who masturbate to excess usually have a long prepuce (they may have none, for Jews masturbate); they get a sallow look, have a sheepish, hang-dog expression; their eyes are deep-set, they incline to melancholy broodings, to sitting by themselves, and reading over a fire rather than to joining their companions at play. They become absent-minded, and their memory seems defective. The hand is apt to be cold and moist in the palm. The skin is often pallid; the innocent frankness of youth is absent.

The young man is over-shy, unambitious, he shrinks from a steady gaze, blushes readily, and seems to be conscious of having done something unmanly and little.

Men who masturbate often show no sign of the habit. They are apt to be cowardly, mean-spirited, poor specimens of humanity; but it is rare for adults to practise masturbation to great excess, and, if they suffer from any of the supposed evil consequences of the habit, it is either on account of excess in earlier life, on account of imperfect sexual hygiene, or irregularly gratified sexual desire, their symptoms assuming a multiplicity of expression, and generally being such as are arranged under the term hypochondria, and manifestly not dependent entirely upon masturbation, since the same symptoms are very common in patients who do not masturbate, who, indeed, are perfectly continent, and since they are not infrequently relieved by marriage. As to atrophy of the genitals, varicocele, chorea, epilepsy, idiocy, insanity, it is quite doubtful if these are often due to masturbation, acting alone; and although this vicious habit may be the most important cause in a given case, and should always be sought for, and if possible corrected, yet undoubtedly usually some other obscure cause of disease is in action, and is, perhaps, to blame for the masturbation as well as the idiocy or epilepsy, as may be inferred from the following (personal) case:

CASE XL.—A young lad, whose intellect was beginning to fail, was frequently caught in the act of masturbation. All moral, physical, and medical means to correct the habit having proved ineffective, as idiocy was becoming more pronounced, the parents demanded castration as the only means of saving the intellect of the child. Instead of cutting out the testicle, it was decided to exsect a portion of the vas deferens on either side, which was accordingly done. The operation was of no advantage, the intellect failed until idiocy became complete, and the testicles both went on to atrophy. When last seen, the idiot was sitting in the corner of a cell in the institution to which he had been sent, fingering himself vigorously, and crying because he could not get an erection.

If it had been loss of semen, in this case, which was producing the loss of mind, the cutting of the seminal ducts would have arrested the progress of the idiocy; furthermore, there must have been some cause at work, which was not apparent, for atrophy of the testicles followed exsection of the ducts, of which physiologists have proved it is not the result (Curling). The same cause which produced the atrophy of the testicles was in this case undoubtedly to blame for the idiocy. Sometimes, after a severe blow on the head, the intellect fails, epilepsy comes on, the boy approaches nearer to the brute and is found to masturbate in excess, and this result of his injury frequently is blamed as the cause of all his troubles.

The foregoing remarks are not intended to palliate, in the least degree, the baseness of the practice of self-abuse, or to deny that lack of physical and sexual vigor, spermatorrhœa, neuralgia of the urethra, etc., may be frequently caused by its excessive indulgence, but they are intended to oppose the idea, seemingly so prevalent, that very few men indulge in the secret vice, and that all who do so suffer; and they are also intended to advance the proposition that in the vast majority of instances masturbation does little harm to the individual, except in regard to his *morale.* It unmans him, makes him untrue to himself, and cowardly; and most sensible boys find this out before a great while, and give up the practice, which they feel to be sapping their manhood and self-esteem.

Treatment.—It is infinitely better that a boy should never masturbate, if he can be saved from it. Prophylactic treatment may save him. In the case of babies who do not do well, nurses should be watched, and discharged as soon as there is any evidence that they are handling the child. If the infant have already acquired the habit, his hands must be tied when he sleeps, and at all other times he must be watched, until he grows out of the habit. Boys should always be made to sleep alone, never allowed to consort habitually with any other boy, especially if the latter be the older; all close intimacies between boys of different ages should be broken up, and, on the appearance of any of the signs of masturbation, a close watch should be kept up.

It is not good policy in most cases to ask a boy if he fingers his privates. He will be pretty sure to say no, and then to tell other lies to substantiate the first. It is the safest course to assume the fact after a careful study of the case, and the boy, thrown off his guard by the statement that he does masturbate, will rarely deny it, or will do so in such a feeble manner—occasionally with such over-positiveness—that he will convict himself. Finally, when the patient has confessed his folly, it is not wise, in most cases, to try to terrify him out of his habit by brilliant and exaggerated statements of the possible misery he may bring upon himself if he does not stop. This is appealing to a base motive, fear of an indefinite evil in the future, and, although sometimes successful, it is often inadequate to the proposed end, for a healthy boy cannot realize what it means to be sick; he cannot understand it, and consequently is not afraid of it. The method of treatment which is most effective, but at the same time the one which requires the most force to carry out, is to elevate the boy out of his bad habit, to shame him, to make a man out of him, to reason with him, and talk to him honestly and openly, without reserve or mysticism; to sympathize with him, not to wound him; to study him and treat him morally. This course will succeed with the greatest number, provided only sufficient time and attention be given to it.

When a man comes complaining of the results of masturbation, an attentive study of his symptoms will not infrequently disclose his disease to be hypochondria, and his malady ungratified sexual desire, with often some neuralgia of the vesical neck. His training should consist in encouragement and continence, with absolute purity of thought, and subsequently marriage, to regulate his sexual hygiene. After marriage it is rare to hear any further complaint from these cases—always provided there is really nothing more than functional derangement at the bottom of the patient's complaint, as is the case in the vast majority of instances.

As for medicines, they are of little or no value; camphor, bromide of potassium, or lupulin, might be given as placebos, but it is doubtful if they are of any efficacy. Cold sponge-baths, out-door sports, physical fatigue, sleeping in a cool room on a hard bed, with a light covering, are all useful; eating lightly at night, not retiring until very sleepy, and rising immediately on waking in the morning, are powerful assistants in breaking up the habit, but all will be of no avail unless the *morale* of the patient be elevated, unless he keep his thoughts pure, and desire, for the manliness of it alone, to be rid of his bad habits.

POLLUTION.

Pollution is a term applied to involuntary emissions of semen in ejaculation, attended by a venereal orgasm, more or less marked. Pollutions are nocturnal or diurnal.

Nocturnal pollutions are exceedingly common. They usually accompany an erotic dream, and the patient wakes just as the ejaculation is occurring. Sometimes, when sleep is profound, the patient does not wake, or, if he does, he forgets his dream. The sensation of pleasure undoubtedly accompanied ejaculation in these cases, but was faint, and forgotten. Nocturnal emissions in moderation are entirely natural, and by no means a sign of disease. Their frequency compatible with health varies with the purity of mind and the sexual vigor of the patient. A man who is happily married rarely has nocturnal emissions while living with his wife, but, if he leaves her for several weeks, it is natural, and entirely the rule, that there should be a formation and collection of semen which, distending the seminal vesicles, excites erotic fancies, and, in the relaxed condition between sleeping and waking, escapes at the conclusion of a dream. Any man suffering from ungratified sexual desire is normally in a condition demanding relief for his over-distended seminal vesicles, and, if that relief be not afforded in some way by the patient, it will come spasmodically during sleep. This is all the more certain to be the case if the patient has established a habit of rapid formation of semen by frequent calls for a supply of the same in excessive sexual intercourse, or masturbation practised as a habit for a considerable length of time: and especially if, when natural or unnatural gratification is given up, lascivious thoughts are indulged in, and impure associations continued. Occasionally nocturnal emissions may be over-frequent, and indicate a condition of irritation in the deep urethra—some modification of neuralgia of the vesical neck which requires treatment.

Treatment.—When emissions do not exceed three times weekly they should be disregarded, and attempts made only to purify the thoughts of the patient, elevate his tone, and get him, if possible, happily married. Where they become very frequent, as nightly or several times a night for a considerable time, besides the employment of all known tonic and hygienic means and the measures detailed above, certain special attempts to correct the habit are advisable. The patient should exercise and develop his muscular system. He should endeavor to sleep soundly, by tiring himself out through the day by physical work. Dry frictions, cold bath, cold douche, locally, are useful. He should sleep on a hard bed, lightly covered. The stomach should not be full on retiring. Most patients have involuntary emissions toward morning, and, waking, find themselves lying on their back. This position, with the bladder somewhat distended, tends to beget erection, and, by avoiding it, pollution may be escaped. This is accomplished by causing the patient to tie a towel round his waist on retiring, with a hard knot in the back over the spine. When he lies upon this knot it will wake him. Besides these means, among all of which purity of thought comes first, bromide of potassium, camphor, and lupulin, may be given internally, with strychnine and a mineral acid, or such tonic as the physical conditions seem to call for, and locally decided advantage may be derived from the gentle use of the steel sound, as in neuralgia of the vesical neck, and finally the cupped sound with tannin, as in spermatorrhœa, or possibly a stimulating prostatic injection.

Diurnal pollution is rare. In some impressionable patients, especially if suffering from prostatic irritability due to venereal excess, the sight or thought of certain women will produce ejaculation, as may a touch upon the glans penis. Ejaculation of semen may be produced by a variety of causes. Lallemand[1] speaks of a man who could produce it by striking his head with his knuckles. Sudden injuries to the spine sometimes produce the same effect. Lallemand quotes from Hedelhofer that a man fell upon the sacrum, and immediately had an ejaculation. In decapitation by the guillotine, unless the neck is severed too low, ejaculation is quite common.

The treatment of diurnal pollution is by steel sounds and local astringents to the prostate, together with most of the means detailed for nocturnal emissions. Circumcision should be performed if the glans penis is sensitive.

SPERMATORRHŒA.

Few terms are more abused and distorted in their significance than spermatorrhœa. The young man into whose hands some pamphlet on "Manhood Restored" has fallen, imagines himself hopelessly doomed to impotence, paralysis, and idiocy, because he has spermatorrhœa, which spermatorrhœa consists in nocturnal pollution, escape of mucus during prolonged erection, appearance of amorphous phosphates in his urine—often in a gleety discharge, due to stricture or a damaged patch of mucous membrane in the urethra, and sometimes, where the diseased mind of a youth suffering from ungratified sexual desire can find nothing else to confirm its suspicions, the natural, healthy, flocculent cloud of mucus collecting normally in all urine, after it has stood a while, is pointed to, in dejected triumph, as a demonstration of the never-ending loss of seminal fluid. Occasionally a patient will even bottle his urine and keep it a week, until it has decomposed, and then bring it to the surgeon in its murky condition, to prove that he has "spermatorrhœa."

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[1] "Des Pertes seminales," Montpellier, 1836, 1842.

Most of the symptoms which a patient usually mistakes for spermatorrhœa have been already disposed of in other portions of this work, and need not be again alluded to (gleet, phosphatic urine, vesical mucus, decomposing urine, etc.). It falls to the lot even of the specialist to see but very few cases of true spermatorrhœa.

Spermatorrhœa is an escape of seminal fluid containing spermatozoa, without ejaculation and without pleasurable orgasm—usually at stool, with the urine, or, to a slight extent, at all times. During prolonged erection under intense sexual excitement, a small amount of true seminal fluid is apt to escape into the prostatic sinus, and to be passed at the next urination. This may happen to any one occasionally, and does not amount to disease.

Causes.—Spermatorrhœa sometimes follows excessive masturbation, occasionally it appears as a sequence of acute general prostration—as after typhoid fever; it may come on in connection with imperfect digestion and general nervous distress from overwork or other cause, or follow chronic disease, of the inflammatory type, of the floor of the prostatic sinus and seminal vesicles.

Symptoms.—In true spermatorrhœa it is usual for spermatic fluid in small quantity to pass from the meatus during defecation, especially if the patient is constipated, and for a certain amount of the same fluid to be voided during urination, particularly in the morning; while, occasionally, jolting, riding, etc., cause a little oozing of a bluish fluid from the meatus, which, on examination, is found to contain spermatozoa. These symptoms alone constitute spermatorrhœa, or indeed the disease may be said to exist where the urine habitually contains spermatozoa, although no semen, as such, is involuntarily passed through the urethra. The subjective symptoms of spermatorrhœa are most varied—very often the patient does not know he has the disease. He complains of some feeling of weight in the prostatic region, of dyspepsia or some nervous derangement, has little care for his sexual functions, and is not disturbed on the subject of impotence; presents, indeed, a most strongly-marked contrast, as far as expressions of distress go, with the hypochondriacal patient imagining himself impotent from spermatorrhœa, and taxing the capacity of his language to express his woe. Patients with true spermatorrhœa are not by any means necessarily impotent, but their sexual appetite is always small. In many cases, however, the general symptoms are those of great lack of nervous tone, dyspepsia, headache, melancholy, neuralgia, loss of spirits, pains in the back, groins, testicles. Such patients tend to grow thin, to lose their ambition and their zest for all ordinary pursuits, to run down, become fanciful, indeed hypochondriacal, and often to fret seriously and unceasingly about their malady, of which they entertain only faint hopes of a cure, which they urgently demand. Finally, in the most severe cases, all the above symptoms are aggravated; the penis shrivels, the testicles become small, flabby, very sensitive, not infrequently neuralgic, the veins of the cord large and full; the loss of semen continues for a long time, finally becomes thinner, more like simple mucus, and at last ceases to contain spermatozoa, being made up of the fluids of the seminal vesicles, the prostate, and Cowper's glands. At last the patient becomes truly impotent, incapable of erection.

Treatment.—All the hygienic, general, and local measures advised for cases of pollution and sexual weakness, already given, become imperatively necessary in treating true spermatorrhœa, with the hope of success in mild cases, and without despair in severe ones. The use of the steel sound and of electricity helps to give tone to the parts. Roubaud thinks well of ergot — two to eight grains daily — in atonic cases. The use of a local astringent to the prostatic sinus is often of marked advantage. The best agent for effecting this is tannin, and the cupped sound the most convenient method of applying it. The cupped sound (Fig. 130) is an ordinary steel instrument, of rather long curve, with six little cups, each as large as a pea, three on either side of the convexity of the curve. In the cups is placed a solid paste of glycerine and tannin, and the instrument is ready for use. In making the application, a steel conical sound, as large as the urethra will conveniently admit, is first introduced, and immediately withdrawn; then the charged cupped sound is oiled and rapidly carried down the urethra, until the cups rest in the prostatic sinus. Here the sound is allowed to remain from one to five minutes, according to the effect desired to be produced. On withdrawal it will be noticed that more or less of the tanno-glyceral paste has melted off and remained behind. The patient experiences some heat in the prostate, possibly pain, if the application has been prolonged. The next following act of urination, which should be delayed as long as convenient, is usually attended by pain, possibly accompanied by a little blood, but the abnormal sensation soon disappears. The applications are to be repeated once or twice weekly, according to the effect, and after a short time a change in the symptoms for the better is usually manifested in mild cases. Should these simple means fail, recourse may be had to prostatic injections with the deep urethral syringe (Figs. 22, 23), a solution of nitrate of silver, not stronger than five to ten grains to the ounce, being used. Failing with this, hope

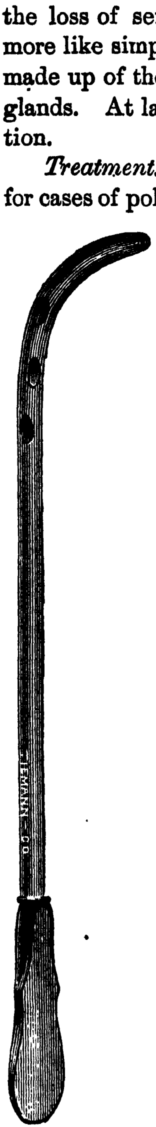

FIG. 130.

must be based upon the continuance of general and local tonic and hygienic measures. The use of the fused nitrate of silver with Lallemand's instrument is not justifiable, for fear of including the orifices of the ejaculatory ducts in an eschar, and obliterating them by cicatrization.

EROTOMANIA.

Erotomania is a species of insanity. It is a disease of the central nervous system, characterized by the existence of erotic desires without the power of accomplishing them, sometimes apparently without the wish to do so, as in a case, which is on record, of a patient so affected, who, when asked what he would do if put to bed with a woman, remarked that he "would go to sleep." The malady is not a disease of the genitals, and does not call for any more lengthy description here.

SATYRIASIS.

Satyriasis is constant desire with erection; erotic delirium. It is also a brain-disease. An illustrative case is quoted by Acton,[1] of an old man who was eminently satyriasic, so much so that he would masturbate in the presence of ladies. Dying, a tumor of the size of a split-pea was found in the pons Varolii.

PRIAPISM.

Priapism is more or less continuous erection without desire. With some forms of priapism intercourse with ejaculation may take place. The connection between injuries of the cerebellum and spinal cord and erection has long been observed. Roubaud[2] quotes Serres in stating that out of eleven cases of cerebellar hæmorrhage erection of the penis was noted six times. Death by hanging is often accompanied by partial erection. After injuries to the spine, and in some diseases of the cord, producing paraplegia, erections are often absent, returning as the paralysis improves. On the other hand, certain diseases and injuries of the cord are notably attended by priapism, disappearing as the paraplegia gets well. Lallemand[3] quotes a case from Fages, of an officer who was thrown from his horse, and became at once paraplegic, and simultaneously had priapism. The latter annoyed him excessively, as it produced retention, relievable only by local and general refrigerants, which reduced the erection. As his paraplegia gradually got well his priapism ceased.

Lallemand gives another very interesting case[4] of a soldier, who, climbing out of garrison to see his mistress, fell upon his sacrum and became partially paraplegic with priapism. He had no venereal desire, yet, because the priapism interfered with his making water, he attempted frequently to free himself of it by masturbation, but without success—there was no ejaculation. On one occasion, with the mistress on attempting to see whom he had acquired his malady, he indulged in copulation almost continuously for several hours, until he had exhausted his partner—but all to no effect. He had no pleasure or ejaculation, yet when asleep he had lascivious dreams, with ejaculation and slight sensation. This was a mixed case, since some of its characteristics are those of aspermatism.

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[1] "On the Reproductive Organs," fifth edition.

[2] *Op. cit.*, p. 280.

[3] *Op. cit.*, vol. ii., p. 62.

[4] *Op. cit.*, vol. ii., p. 64.

The effect of large doses of cantharides in producing erection without desire is well known.

Prolonged mental exertion, over-anxiety, and other causes capable of reducing the tone of the nervous system are sometimes attended by priapism, due perhaps (immediately) to some local injury, as illustrated in the following personal case:

CASE XLI.—A married gentleman of thirty-seven had gonorrhœa at twenty-seven. No functional or other distress followed for several years. After a time he had nocturnal emissions, for which a physician used the steel sound—causing slight epididymitis. Two years before his application for relief, a steel sound, about No. 10, had been introduced. At the time he was overworked, and somewhat run down in health. The muscles of the membranous urethra opposed considerable spasmodic resistance to the passage of the sound. About one hour afterward he had a sudden severe pain at the neck of the bladder, "as if he had been shot," and shortly afterward his testicle began to swell. His priapism commenced at the same time. It never troubles him while awake, but after he has been asleep a few hours he has a distressing dream—such as trying in vain to catch a train—and wakes up with a powerful erection. This subsides shortly, but recurs at once on attempting again to sleep, and so continues waking him several times before morning. The erection is not accompanied by desire. He rarely has emissions. This state of things has been repeated nightly for two years, with the exception of one night. He has satisfactory intercourse with his wife once a week, but with no effect upon his nightly priapism. He has been under various treatments for two years, without benefit. His prostatic urethra had been cauterized, without bringing any relief. General health seemed fair.

Priapism in children is often due to stone in the bladder, tight prepuce, worms in the rectum, etc. Extreme cases are on record where priapism has terminated in gangrene of the penis.

Treatment.—Priapism usually gets well under hygienic and symptomatic treatment, beyond which no special measures can be suggested, except irritating the lower part of the spine, blistering the perinæum, an India-rubber seton at the nucha, possibly the use of electricity, and strychnine, ergot, bromide of potassium tentatively.

ASPERMATISM.

Aspermatism is a peculiar condition of very rare occurrence, amply illustrated in the following (personal) type cases, one of which has been already published. There are erection, some desire, no ejaculation—in other words, impotence:

CASE XLII.—A married gentleman of thirty comes, complaining of inability to have children. He is spare, undersized, but healthy, and strong, straightforward, and truthful in manner. He has lascivious dreams at two to six weeks' interval, attended by profuse seminal emissions. He can never, with his wife or in any other way, provoke or bring about a venereal orgasm or a discharge of semen. The effort is attended by no pleasure at the time. He indulges once a month as a duty to his wife, and in the hope of a more successful issue. In his dreams he has a full orgasm and emission—awake, never. He has never attempted to masturbate, or had any desire to do so. His prepuce being very long, circumcision was performed, but neither that nor any efforts in the way of treatment proved beneficial.

CASE XLIII.—A farmer from the West, aged thirty-six, married at twenty-seven, comes with the following story: When first married, nine years ago, he had sexual intercourse three or four times weekly, latterly only once a month. During the first two years after marriage he frequently had intercourse three or four times a night, vainly trying to get an ejaculation. Before his marriage he never attempted copulation, and never in his life, he says, before, during, or after the sexual act, has he had the least pleasurable anticipation or excitement. He had intercourse only in the hope of producing an ejaculation, and having children, which he ardently desired. He is a plain-spoken, straightforward, honest, truthful farmer, living out-of-doors, eating well, performing all his functions excellently, but now a little depressed by the fact that years of treatment have done him no good. He never masturbated, as he had no desire to do so. In sleep he occasionally dreams of sexual intercourse, and wakes with a pleasurable sensation, to find that he has had an emission of semen, which he discovers on his linen. His testicles are large and perfect, he has full, vigorous erections, and can have continuous sexual intercourse for half an hour, only stopping because he is exhausted, his erection continuing as powerful as ever

A full-sized sound passed into his urethra produced the ordinary sensations in the fore part of the canal, but the prostatic urethra was absolutely insensitive.

These two cases tell the whole story of aspermatism. In both of them there was undoubtedly a little desire by anticipation, or at least from memory of dreams, or the patient would not have indulged "three or four times on the same night."

The theory advanced to account for this strange malady is that, by reason of spasm about the ejaculatory ducts, the semen is prevented from getting into the prostatic sinus. This, however, is untenable; for, were there desire and pleasure, prostatic mucus would be secreted in excess, and would be thrown out by ejaculation, while the semen proper would collect and distend the seminal vesicles and ducts below the ejaculatory orifices, and would escape and flow away from the meatus, after the relaxation of spasm, brought about by the fatigue following "half an hour's sexual intercourse." But this is not the case. The fault is evidently in the nerves. There is no pleasurable sensation, no call for secretion of prostatic mucus, or for a supply of spermatic fluid. There is anæsthesia of the prostatic sinus, and, although the power of having an orgasm and an ejaculation remains, as proved by dreams, yet there is some connecting link missing in the chain, which transforms friction of the glans into pleasure at the prostate, and finally into secretion in the testicle.

Treatment.—Roubaud advises antispasmodics, on the theory that muscular contraction is the essence of the disease. He speaks of success in one case of a young man, by blistering the perinæum, and powdering the surface for several days with morphine. Since the absence of sensation in the prostatic sinus is present in some cases, it is possible that the local use of electricity to that region might be of advantage, or even of astringents with the cupped sound.

CHAPTER XXVII.

DISEASES OF THE CORD.

Anatomy.—Spasm of Cremaster.—Varicocele, mild, severe.

The cord is made up of the vas deferens, the habenula or remains of the peritoneal process going from the tunica vaginalis to the abdomen, vessels and nerves, all held in an atmosphere of connective tissue, containing unstriped muscular fibre (internal cremaster of Henle). Outside of these there is a continuous layer of connective tissue, adherent to the tunica vaginalis below, and continuous with the fascia transversalis above, called tunica vaginalis communis. Outside of this the cremaster muscle lies in loops, some embracing the testicle in a fan shape, others extending only a short distance down the cord.

The arteries are the spermatic from the aorta, the deferential from the superior vesical, the cremasteric from the epigastric. The veins from the testicle and epididymis unite in the pampiniform plexus, and constitute the bulk of the cord. The larger veins have valves; they unite usually to form one large trunk, which empties, on the left side, into the renal vein, on the right side into the ascending cava. The spermatic plexus of nerves is derived from the renal, aortic, superior mesenteric, hypogastric, and lumbar (genital branch of genito-crural nerve supplying the cremaster).

The cremaster muscle varies in size and power, in different subjects; it is a voluntary muscle; most persons can exercise it simultaneously on both sides, drawing up and holding the testicles against the abdomen; occasionally the muscles can be exercised separately, one testicle being elevated while the other is lowered. The function of the muscle is to assist in sustaining the testicle by its tonic contraction, and to compress the organ during the sexual orgasm. The muscle is subject to painful spasmodic contraction in kidney-colic, in neuralgia of the testicle, and sometimes in connection with prostatic or urethral irritation. A large portion of the cremaster muscle was excised by the late Valentine Mott, for obstinate spasm.

Case XLIV.—Mr. ——, aged thirty-five, was married to a wife suffering from uterine disease. His sexual relations were irregular and unsatisfactory; he had slight stricture and neuralgia of the vesical neck. With this, he complained of painful spasmodic contraction of the left cremaster during sexual intercourse. Regular sexual relations with his wife, and the use of a steel sound, relieved all the symptoms.

(For spasm of the cremaster, *see* also the case quoted at p. 372.)

The spermatic cord is rarely diseased. There is more or less turgescence of the veins, with sensibility to pressure, in the different inflammatory conditions of the testicle and vas deferens, and injury may lead to local inflammation, to be assuaged by rest, hot fomentations, etc. Diffuse and encysted hydrocele and hæmatocele of the cord have been considered in connection with similar conditions of the testicle. Fatty tumors are occasionally found. They cannot be diagnosed from encysted hydrocele without an exploratory tapping, and are liable to be mistaken for hernia when located within the inguinal canal. They generally occur later in life; if large, they have a doughy feel, and are lobular in character; treatment is rarely required. In cases of doubt, when the tumor might be an omental hernia, the utmost care is necessary in operating for removal. Calcareous deposits have been encountered in the cord. Verneuil[1] found a large, gummy (syphilitic) tumor in the cord.

VARICOCELE.

Varicocele is constituted by a varicose enlargement of the pampiniform plexus and veins of the cord. In a mild form, it is perhaps the commonest affection of the genital organs. It has been estimated that about ten per cent. of males have slight varicocele. It occurs almost invariably on the left side; when very marked on this side, it may exist slightly on the right, but varicocele of the right side alone is almost unknown. Pott met with it on both sides only once. Breschet, in one hundred and twenty operations, operated only once on the right side.

Slight turgescence of the veins of the cord does not deserve to be called a disease. The chief factor in its production is ungratified sexual desire, frequent erotic fancies not finding relief, or, less often, the opposite condition, abuse of the sexual powers, by which the veins are kept constantly engorged. The largest proportion of slight varicoceles which are encountered are found in young unmarried men, or old bachelors; the affection rarely commences after twenty-five; it is unusual to find it in a married man whose sexual relations are satisfactory. The slight turgescence of the veins constituting the varicocele of the young bachelor and often causing him incessant and needless alarm usually disappears after marriage, together with the uneasy sensations which accompanied it.

Old men whose testicles are inactive rarely have varicocele, though their legs show many tortuous veins, and their tissues be degenerating. This fact is of the utmost importance, and is dwelt upon thus early in the consideration of the disease, in order that attention may be specially directed to it. The idea that slight varicocele is often a sexual derangement, a functional disorder depending upon bad sexual hygiene, is not brought out by text-books, and is rarely appreciated by practitioners. Young men in many cases distress themselves unceasingly, and importune their surgeon for an operation to cure a disorder which would be more speedily and effectually removed by marriage.

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[1] "Bulletin de la Société d'Anatomie," second series, vol. i., 1856.

The degree of varicocele alluded to above may be dismissed briefly. It is found upon the left side; the vessels are a little full, the cord loose, feeling like a small bundle of earth-worms, perhaps as large in some cases as the thumb; the testicle is perhaps over-sensitive (irritable), and there is usually a slight dragging sensation in the groin, but beyond this nothing except the fancied ills and the hypochondriacal complainings of the young man who is cheating Nature or abusing her gifts. The proper treatment of such cases is found in the employment of all hygienic and tonic measures. The patient's mind must be diverted, he must be dissuaded from an operation, told to wear a snugly-fitting suspensory bandage, and if possible to forget his sex until an opportunity of marriage affords him a chance to get well. As a local measure, the free application of cold water to the parts daily is a very useful adjuvant.

Varicocele serious enough to constitute a disease and demand active surgical measures for its relief does, however, occur, though rarely. It is an exaggeration of the milder form; it comes on in early manhood, and has no connection with varices of the legs or anus (hæmorrhoids). It is found on the left side, rarely on the right. The cause of this is believed to lie in the following facts: The left testis hangs habitually lower than the right, only the larger veins of the cord have valves; the left vein empties at a right angle into the left renal vein, the right at an acute angle into the ascending cava; the position habitually assumed by men, of standing on the left foot, has been supposed to add to other predisposing tendencies. The veins of the cord, in any case, would seem to be in a position ready to become over-distended, as they lie loose and dependent in the scrotum, and then pass through the comparatively narrow inguinal canal. The position of the sigmoid flexure of the colon, on the left side, so often distended by fecal accumulation, is also believed greatly to assist in the formation of left varicocele, which is always worse during obstinate constipation. In the female, the ovarian veins are rarely found varicose, except in the left side. Sir Astley Cooper never saw it on the right; the sigmoid flexure seems at fault. Pressure upon the veins at the groin, abdominal tumors, etc., assist in causing varicocele. Sometimes, during sudden effort, varicocele appears at once, and increases rapidly; occasionally it occurs acutely shortly after orchitis. Pott[1] has recorded three cases, where, after fatigue, local injury, and cold, sudden pain in the back set in, followed, in a few days, by relief from the pain, and an acute varicocele, which in its turn was succeeded after some days by complete wasting of the affected testis, in one case, of both. Probably, in these cases, there was some inflammatory condition obliterating the veins above.

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[1] Quoted by Curling.

Symptoms.—Except in acute cases, such as those just detailed, varicocele comes on gradually, and is discovered by accident. The amount of pain complained of is very variable; a very large varicocele is often attended by absolutely no pain, while a very slight enlargement of the veins may give rise to considerable uneasiness, extending up the back and down the thigh, perhaps amounting to neuralgia of the testis. Landouzy[1] has noticed that the symptoms are markedly relieved during and immediately after coition, but become worse on the following day.

In a full-formed varicocele the vessels are elongated, their valves broken down, their walls affected by fatty atrophy, and thickened, as is also the surrounding connective tissue. The mass fills up one side of the scrotum, perhaps encroaches on the other; its shape is somewhat pyriform; the loops of veins often hang below the testicle. The mass feels soft, like a bunch of earth-worms; there may be phlebolites in the veins. The veins of the testicle, also, between the tunica vaginalis and the tunica albuginea, are in bad cases varicose. The scrotal veins may be similarly affected. The scrotum is thin and relaxed, the dartos powerless; sometimes the integument is so thin that the blue color of the blood in the veins of the cord is visible. In long-standing cases of severe varicocele the circulation of the testis is liable to be interfered with to such an extent as to cause the gradual atrophy of the organ, a result in no way due, as has been intimated, to the weight of the mass of veins. The only general symptoms in varicocele besides pain are those of hypochondria and defective *morale*, so common in all affections of the genital organs.

Diagnosis.—There is perhaps no disease less liable to be mistaken than varicocele; the wormy feel and peculiar look of a cord surrounded by large tortuous veins are hardly to be confounded with any thing else, unless, possibly, omental hernia. A simple test, however, removes all doubt. If the patient lie down, the whole swelling may be readily reduced. The fingers are now placed at the abdominal ring, and the patient is told to rise; hernia will be retained, the swelling of varicocele will return, the vessels filling from below upward. If the pressure at the ring be strong enough to compress the arteries as well as the veins, the tumor will not reappear. Varicocele complicated by large hydrocele, or by hernia, is more difficult of diagnosis.

Treatment.—If varicocele be large, but the symptoms to which it give rise inconsiderable, the palliative treatment already recommended for simple cases will suffice. Varicocele never compromises life, rarely deteriorates health, and, when it is simply clumsy and mechanically inconvenient, it should be overcome by mechanical means. All the operations proposed for varicocele have been attended by fatal consequences, and it is unsurgical to endanger life for a disease in itself harmless. A well-fitting suspensory bandage is a fair substitute for a tight scrotum, and is efficient by sustaining the weight of the engorged mass. It is more comfortable than Wormald's expedient of pinching in a portion of the scrotum drawn through a silver ring, and better than the other palliative treatment which has been proposed, of covering the scrotum with many coats of a solution of gutta-percha, or than a truss to sustain the weight of the mass of blood at the ring.

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[1] "Du Varicocèle."

In those cases of serious varicocele where the patient is kept in a state of constant unrest, and worried into bad health by morbidly dwelling on his troubles, when there is much dragging pain or neuralgia, when the testicle seems liable to atrophy, when the suspensory bandage fails to relieve, or the patient refuses to be satisfied by it, it becomes necessary to operate. In the vast majority of cases but one operation is allowable, namely, cutting off the redundant scrotum, and thus forming a natural tight suspender to take off the weight of the testicle from the cord, and mechanically shorten the column of blood. All the other operations without exception, ligature—mentioned by Celsus, and which cost Delpech his life in the well-known case where this operation on both sides caused atrophy of both testes, and led to the subsequent assassination of the surgeon by his patient—Brodie's division of veins, Petit's excision, figure-of-8 pressure over a pin beneath the veins, the numerous methods of subcutaneous ligature, of which, perhaps, Ricord's is the favorite, Luke's fistula tourniquet, Breschet's external clamp, injection of persulphate of iron, division of the veins by galvano-caustic, galvano-puncture—all of these, and others like them, are subject to the grave objection that they have in view the inflammatory obliteration of the offending veins, and are liable to be attended by general pyæmia (thrombosis, embolism) and death. Success has been reported after each of these operations, but there have been many failures, and some deaths. The objections to these operations are four:

1. Danger of pyæmia.
2. If all the veins be not occluded, a relapse is to be feared.
3. If absolutely all the veins should be secured, atrophy of the testis follows.
4. If the artery be accidentally included with the veins, atrophy follows.

In short, no operation proposed offers a fair prospect of relief without serious accompanying risks, except excision of the scrotum.

The objections urged against this operation are possible erysipelas and hæmorrhage. The former is not to be dreaded if the patient's general condition will warrant any operation, while the latter may invariably be controlled by opening the wound, if necessary, and searching for bleeding points. The operation bears the name of Sir A.

Cooper. It is only curative in the sense of preventing further disease, arresting atrophy of the testis, and usually relieving pain. The result is nearly uniformly satisfactory, although occasional failures to relieve pain have been reported. But in this latter particular even castration sometimes fails, and, should pain persist after ablation of the scrotum, there would always remain, after the employment of sexual hygiene by marriage, the treatment of neuralgia of the testis; or, finally, one of the many operations for occlusion of the veins, of which the simplest is, perhaps, to carry a silver wire subcutaneously around all the larger veins inclusively (this requires transfixion of the scrotum), leaving out the artery and vas deferens (which always lie near each other), and bringing the ligature finally through the same orifice at which it entered. The operation is claimed by Bozeman.

In the performance of the operation for curtailing the scrotum, a special clamp is necessary. Several good clamps have been devised for the purpose, and may be found in the shops. In operating, the danger is not of taking too much, but too little tissue. The patient is etherized, an ample fold of scrotum pinched up parallel to the raphe and including it, the clamp applied and tightly screwed. The redundant tissue beyond the blades is removed, and interrupted sutures closely applied, the more the better. If bleeding be greatly feared, each suture should be a foot long, so that the lips of the wound may be widely separated, and bleeding points secured before the edges are coapted. Every little clotted point must be scraped with the nail, to find the bleeding vessel, which should be tied. Finally, the edges of the gaping wound are brought accurately together by the long sutures first applied, and strips of adhesive plaster; a compress and T-bandage complete the dressing. Secondary hæmorrhage is to be feared into the loose tissues of the scrotum, unless all bleeding vessels have been ligated. The patient remains in bed until union is accomplished.

CHAPTER XXVIII.

DISEASE OF THE VAS DEFERENS AND SEMINAL VESICLES.

Anatomy.—Inflammation, acute and chronic.

The excretory duct of the testicle commences at the tail of the epididymis, forms one of the principal constituents of the cord, passes through the inguinal canal, curves down into the cavity of the pelvis, skirts the base of the bladder, and, joining with the duct from the seminal vesicle, terminates as the ejaculatory duct on one side of the summit of the veru montanum in the prostatic sinus. The canal is nearly two feet long, from a line to a line and a half in diameter. Four-fifths of its structure is muscular. It is very dense and hard, and feels like a whip-cord when rolled between the fingers. Its outer coat contains condensed connective tissue, elastic fibres, vessels, nerves, and a little longitudinal unstriped muscle. The middle tunic is muscular, its external and a few internal fibres run longitudinally, the middle fibres are circular. The internal tunic is mucous, provided at its commencement with ciliated epithelium. This membrane lies in longitudinal folds, more or less reticulated, particularly in that part of the canal lying within the brim of the true pelvis. Here the cavity of the canal usually enlarges into a sort of reservoir, while the sides are furnished with pouches and diverticula, recalling the appearance of the seminal vesicles. The dilated portion of the canal is well supplied with simple sacculated glands. They are filled with numerous yellowish-brown granulations which give a peculiar color to the mucus of the part.

The vas deferens may end in a blind extremity or be deficient when there is no testis. It is rarely diseased. It participates in tubercular and pseudo-tubercular disease of the epididymis. Portions of its structure so diseased may soften and form abscesses, which break externally, or perhaps internally, followed by a slight discharge of bloody pus from the urethra, and perhaps leading to occlusion of the canal during cicatrization.

DISEASES OF THE SEMINAL VESICLE.

The seminal vesicle is a reservoir connected with the vas deferens. Its function is to collect seminal fluid, dilute it by an admixture with its own secretion, and hold it ready for use. The vesicle, from one to two and a half inches long by half an inch broad, lies at the outer side of its own vas deferens, its apex embedded in the prostate, its fundus diverging from its fellow of the other side, so as to skirt that portion of the bladder which usually lies in contact with the rectum, and corresponds to the trigone within. The vesicle is simply a tube so rolled up and doubled upon itself that its blind extremity nearly corresponds in position to its neck. When unrolled, the tube measures from four to eight inches. It is plentifully supplied with diverticula and branched pouches, so as to present on section the appearance of a cellular cavity. At the neck a short constricted canal joins the vas deferens at an acute angle, to form the ejaculatory duct. The minute structure of the walls of the seminal vesicles is identical with that of the vas deferens. The convolutions of the tube are united by connective tissue, containing a large amount of unstriped muscle. After surrounding the vesicle, this tissue crosses over and envelops the vesicle of the other side. The whole is known as the posterior aponeurosis of the prostate.

The arteries of the seminal vesicles come from the inferior vesical and middle hæmorrhoidal. The veins join the plexus on the sides of the bladder. The lymphatics go to the pelvic ganglia. The fluid of the vesicles is albuminous, and contains many yellowish bodies and masses of spermatozoa. The vesicle discharges by contraction of its own wall, of the muscular membrane surrounding it, and of the levator-ani muscle. An acquaintance with the position of the seminal vesicles is essential to the performance of puncture of the bladder by the rectum, or of the retro-vesical operation for stone. When the bladder is full, the vesicles are pressed apart, and it would be difficult to wound them. Cruveilhier,[1] however, speaks of a specimen, presented to the Anatomical Society by Deville, where the two vesicles were confounded in a single median pouch with two differential canals. This anomaly is very rare.

ATROPHY of the seminal vesicle follows atrophy of the corresponding testicle or its ablation. The vesicle is also absent or defective where there is no testicle of the same side. The vesicles are partly embedded in prostatic hypertrophy, and become involved in prostatic cancer.

The only morbid conditions of these organs, however, commonly met with in practice, are inflammatory and tubercular disease. Congestion of the prostatic sinus, in individuals given to venereal excess, especially if they be weakly, leads to a lack of tone in the ejaculatory ducts, so that they remain more or less patulous. Under these circumstances involuntary emissions are frequent, and a flow of semen may occur on urination, or during efforts at straining, particularly at stool, if there be constipation. The pressure of the levator ani and of the fecal mass upon the seminal vesicles forces their contents through the relaxed ducts (spermatorrhœa).

INFLAMMATION OF THE SEMINAL VESICLES.—This affection is rare. It is usually unilateral, and is due to extension of inflammation from the prostatic sinus.

Symptoms.—Digital examination by the rectum reveals a hot, sensitive, oval swelling behind the prostate, in the position of the seminal vesicle, perhaps on both sides. The size is double, or more, that of the normal vesicle. The surface is hard and uneven, or fluctuating. There is complaint of a continued, heavy pressing (perhaps pricking) pain in the rectum, low down, shooting toward the sacrum. The pain often involves the testicle, which is sensitive and turgescent. Urination may be difficult, on account of the pain, which is increased by rectal examination, and greatly aggravated during defecation. There may be frequent painful erection, perhaps priapism. Any attempts at sexual intercourse greatly aggravate the pain. There may be involuntary painful nocturnal emissions of semen mixed with pus and streaked with blood, and a constant viscid purulent discharge from the urethra, also colored or streaked with blood, and containing spermatozoa.

These symptoms may subside after a few days or persist in a chronic form indefinitely, there being a gleety discharge containing seminal elements, and more or less sexual irritability. This may wear the patient out, leading to serious melancholy or hypochondria. The symptoms, however, may gradually improve with the general health up to complete recovery. If the inflammation reach a high grade, the duct of the vesicle becomes obliterated, abscess forms and discharges into the urethra or rectum, leaving fistula behind. After such abscess and fistula, the vesicle sometimes gradually atrophies, and with it the vas deferens and epididymis of the same side are very apt to dwindle away. Finally, the chronic inflammation, under the influence of general impaired vitality, may lead to thickening of the walls of the vesicle, cheesy degeneration with softening, abscess, fistula, calcification, etc.

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[1] *Op. cit.*, p. 375.

Treatment.—The treatment for acute inflammation of the seminal vesicles is absolute rest in bed, with opiate suppositories, and perhaps camphor and lupulin, to modify erection. This, with local application of heat, warm enemata, and an early opening through the rectum of any abscess that may form, constitutes the treatment. Any chronic inflammation, with gleety discharge, which may be left behind, must be combated with general hygiene and tonics.

Tubercular Disease of the Seminal Vesicles.—This affection may occur without any antecedent local inflammation, or may follow chronic inflammatory disease. Cheesy, yellow masses of deposit occur, which tend to soften centrally. It rarely is seen, except in connection with more advanced disease of a similar character in the prostate, epididymis, kidney, or bladder. The vesicle is often involved synchronously with the vas deferens, and may be felt through the rectum, hard, knobbed, irregular, perhaps insensitive to pressure, perhaps tender, more or less inflamed, and with softened spots. If abscess form, it discharges into the rectum, or perhaps into the prostatic sinus, leaving a cavity in connection with the latter, which furnishes a constant supply of gleety material such as escapes from the urethra in tubercular prostatitis.

Treatment.—Local treatment is symptomatic. The general measures, which may be curative if conscientiously followed out, have been given in the sections upon treatment of the same morbid condition of the prostate, bladder, and epididymis.

PART II.

CHANCROID AND SYPHILIS.

CHAPTER I.

CHANCROID.

Definition.—Transmissibility to Animals.—Cause of Chancroid.—Indefinite Inoculability.—Relative Frequency.—Methods of Contagion.—Explanation of Apparent Long Period of Incubation.—Situation of Chancroid.—Symptoms.—Course.—Character of Scar.—Variation of Chancroid from Type, in Initial Form, in Shape, in Number, in Size, in Duration, in Pain, in Condition of Base, in Course (Relapse).—Complication by Vegetations, by Syphilitic Chancre, by Inflammation, by Gangrene and Gangrenous Phagedena, by Pultaceous Phagedena, by Bubo, by Lymphitis.—Diagnosis of Chancroid.—Prognosis.

Custom in America has adopted the name "chancroid" (originated by Clerc), to express that form of contagious venereal ulcer which is not accompanied by any constitutional syphilitic infection. It is widely known also as soft chancre, or simple chancre; but, of the many terms, perhaps chancroid is the least liable to lead to ambiguity, and it is essentially appropriate, as signifying a disease which, while it is like a (syphilitic) chancre, is still, in fact, widely different from it. For true chancre, the initial lesion of syphilis, the term syphilitic chancre will be adopted.

Fournier's[1] definition of chancroid is clear, comprehensive, and could hardly be improved. Chancroid "is a specific malady, consisting in a peculiar ulcer which secretes a virulent, auto-inoculable pus. It is a malady exclusively local, never giving rise to any symptom which can be referred to a constitutional infection."

Of the three distinct venereal diseases—gonorrhœa, chancroid, syphilis—gonorrhœa is, strictly speaking, the most venereal, being practically never acquired except in sexual intercourse. Chancroid, equally virulent, is less venereal, and recognizes many methods of infection besides sexual congress; while syphilis is of all the least virulent (in the sense of the facility with which it may be acquired), and the least venereal, as will be shown, when treating that subject.

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[1] Art. "Chancre," "Dict. de Méd. et de Chir. pratiques."

Chancroid is an affection only perpetuated by contagion, but for this sexual intercourse is not essential. Wherever upon the human body a chancroid is found, there, it may be positively affirmed, pus from some other chancroid has been deposited under conditions favorable for its absorption. No amount of sexual excess, no degree of uncleanliness, no irritation, traumatic or chemical, however prolonged, no simple or poisonous ulceration from other specific source (syphilis, cancer, glanders, etc.), nothing, in short, can produce chancroid except chancroid (chancroidal bubo of course included): so that, as Fournier puts it, if all the patients in the world with chancroid would avoid contact with others until their malady got well, the disease would cease from off the face of the earth. Of syphilis this much cannot be said; its methods of propagation are far more numerous than simple local contagion.

Chancroid, furthermore, is transmissible to animals. Some experimenters have obtained only negative results; others have been successful, showing that, although animals may receive the disease, they do so imperfectly and often not at all. Chancroid developed on animals heals quickly. Auzias Turenne, in 1844, first successfully inoculated monkeys, rabbits, cats, and dogs, with chancroid. Robert de Weltz, in 1850, inoculated his own arm four times with pus taken from chancroids artificially developed upon a cat and a monkey: all four inoculations took and produced the characteristic ulcer. Diday, in 1851, from a chancroid which had been produced by inoculation upon the ear of a cat, inoculated himself successfully on the penis. The ulcer became phagedenic and was attended by suppurating bubo. Ricordi[1] brought about a chancroidal bubo in a rabbit, which he had inoculated with pus from the chancroid of another rabbit.

It was in connection with experiments of this order that Auzias Turenne invented the term "syphilization," since he found that reinoculation of chancroid pus upon animals resulted in a less and less perfect ulcer each time, until no effect was produced at all.[2] As Auzias Turenne recognized no difference between chancroid and syphilis, he supposed that this immunity of the skin of animals to chancroid pus indicated that they were saturated with syphilis, "syphilized," and exempt from all further trouble from that disease. Hence the term syphilization, which, starting in a misconception, has been perpetuated even to our day, and has still some conscientious advocates.

Cause.—As already stated, the cause of chancroid is unique. It can be produced only by the contact of pus from a similar ulcer upon some portion of the skin or mucous membrane under conditions favorable for absorption. No one is exempt. The bearer of a chancroid is just as liable to be poisoned by the pus of his own sore as is a perfectly healthy person. Other diseases do not furnish any immunity.[1] Positive results are obtained by inoculation upon patients with cancer, with syphilis, with scrofula, with elephantiasis, and a previous attack of the disease does not insure in any manner against succeeding attacks.

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[1] Quoted by Bumstead. [2] Letter to the Academy of Sciences, 1850, quoted by Rollet

Rollet,[2] following Von Roosbroeck's lead, has demonstrated by experiment that the contagious principle resides in the pus-corpuscles, and, if these be filtered out, all inoculations with the remaining fluid prove negative. What this contagious principle or virus is, has not yet been discovered. Assertions have appeared from time to time (Donné, Didier, Salisbury), that a peculiar parasite has been discovered, now animal, now vegetable, which was the essential poisonous agent, but the authors of all such theories thus far have failed to substantiate their claims, and it still remains for the chemist or the microscopist to demonstrate in exactly what the poison of chancroid consists. Thus far the pus of chancroid is identical, under all tests, with pus from any other ulcer. By its poisonous effects alone it is distinguishable. These effects may be studied by inoculation.

Chancroidal pus preserves its poisonous properties if kept cool in tightly-corked bottles. Boeck states (oral communication) that they are in the habit of sending it from the hospitals of Christiania into the surrounding country for purposes of "syphilization." It may be frozen, and still inoculable when thawed. Boeck believes that it loses its virulence after having been dried. Dried pus certainly sometimes fails to give positive results when remoistened, but this cannot be relied upon, as Sperino[3] used a lancet which had been laid aside for seven months, upon the point of which was some dried chancroidal pus. Three punctures were made with this lancet, all of which took. Heat, however, at the boiling-point, destroys the activity of the virus; acids, alkalies, alcohol, all destroy its virulence at once, and decomposition is fatal to it. When gangrene attacks a chancroid, the sore is no longer poisonous.

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[1] It has been stated that chancroid will not take upon a patient suffering at the time from acute febrile disease. To test this point, Dr. Fiset, at the Charity Hospital, at my suggestion undertook some experiments. They were, unfortunately, interrupted after the doctor had inoculated one patient three times upon the thigh—the gentleman in charge of the fever wards being fearful lest syphilis should be introduced among his patients. The one case inoculated was, however, carefully studied by Dr. Fiset. The inoculations were made at the end of the second week after chill, the patient's temperature ranging at 103–104° Fahr. Boeck's method was used, and three punctures made, one-quarter of an inch apart. Two of the punctures took perfectly, although the process of ulceration was very slow. On the thirteenth day pus from one of these ulcers was inoculated upon a healthy patient, with the effect of producing a characteristic chancroid. The ulcers on the leg of the typhoid patient finally became confounded in a single ulceration two inches in diameter, which was dressed with iodoform, and on the patient's discharge from the hospital, convalescing, after a sojourn of fifty-three days, the ulcer was reduced to a diameter of one inch, and was healing. The ulcers were under observation after inoculation forty-six days. The evening temperature remained near 104° for several days after inoculation.—KEYES.

[2] "Traité des Maladies vénériennes," Paris, 1866.

[3] "Studi clinici sul Virus sifilitico," Turin, 1863.

With the above, and kindred exceptions, a mixture of chancroidal pus with any indifferent menstruum does not injure its virulence; such as water, urine, saliva, sweat, mucus, muco-pus, spermatic fluid.

As to the amount of pus required to effect contagion, probably one microscopic pus-corpuscle is sufficient. The smallest possible prick of the skin to which the pus is applied will produce just as characteristic a chancroid as will the bountiful smearing of a raw surface of any size. Puche[1] got positive results by inoculation from a drop of pus diluted with half a glass of water.

The poisonous effect of chancroidal pus is evinced by its power of rapidly begetting a chancroid whenever it is brought within the reach of absorption, by a removal of the cuticle or external layers of epithelium from any surface. Inoculation or hetero-inoculation signifies the contact of this pus with an abraded surface of any individual other than the one who furnishes the pus. Auto-inoculation signifies such contact upon the body of the bearer of the chancroid. Evidently such inoculation may be the result of accident or design.

Chancroidal poison is indefinitely auto-inoculable. Lindmann inoculated himself 2,700 times, and was still making successful auto-inoculations when last reported by Fournier. The body of Auzias Turenne is said to have been found covered with chancroid scars at his death, showing that he did not shrink from practising his pet theory, "syphilization,"[2] upon himself.

By the process of syphilization, immunity of the skin to the poison is obtained. A certain pus is employed, and reinoculated until it will no longer produce a pustule; then fresher pus from some other younger chancroid, until it also fails; and until, finally, no inoculation gives a positive result. This much syphilizers have taught us, and they have also taught us that the different regions of the body are susceptible in a different degree to the action of a chancroidal pus of given virulence; for, after the chest fails to take, the arms may still be inoculated successfully; and, finally, when the arms have acquired immunity, the thighs will still furnish characteristic results upon inoculation. This immunity, however, obtained by frequent and continuous irritation of the skin with numerous chancroid ulcers, is more apparent than real, since it is only temporary; for, after the skin has had a rest for some months, inoculations often again give a positive result (Boeck, oral communication).

Hence the rule, practically true: an individual may have chancroid as often as he is exposed; there is no limit to the number of possible attacks.

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[1] Ricord, "Leçons sur le Chancre," Fournier.

[2] The term syphilization is here used in the sense first given to it by Auzias Turenne, but it must be understood that, in accordance with the views advanced in this treatise, the term is essentially incorrect, as the virus of true syphilis is entirely distinct from that of the chancroid ulcer.

Frequency of Chancroid.—Statistics as to the relative frequency of chancroid and syphilitic chancre are usually made up from hospital experience. Such statistics show that chancroid is twice, or sometimes more than twice, as frequent as syphilitic chancre. Puche, from ten years' statistics at the Hôpital du Midi, gives eighty per cent. of chancroid cases. Fournier arrives at a far different result from the statistics of his patients seen in private practice, patients whose social position was usually high. Out of three hundred and thirty-four cases, he found [1] only eighty-two of chancroid, while all the rest were syphilitic chancre. The reasons of this singular difference of figures are obvious. The lower classes of society who enter hospitals are given to intemperance, and careless in their habits. Furthermore they are poor, and consort with the lower orders of prostitutes, those who are unable to care for themselves when diseased, but must continue at their profession to gain their daily bread. Most of these also are old, have had syphilitic chancre, and contagious secondary lesions in their youth, and are therefore incapable of giving syphilitic chancre, while many of them possess old chronic chancroid, which is kept from getting well by constant local irritation, and which forms a hot-bed of infection for all who approach. Old prostitutes get used to the idea of having a chancroid, and consider it a small matter. The more refined and wealthy males of the upper classes, on the contrary, are careful in their selection of females. They seek the young, and those apparently sound. Young prostitutes are often unaware of having syphilitic chancre or secondary lesions of the vagina, while they can scarcely be ignorant of the presence of the more formidable-looking chancroid with its possibly accompanying inflammatory bubo, and fear prompts them to seek medical aid, and give up their profession temporarily in the latter case, while they might innocently continue it in the former. Furthermore, none of the upper classes appear at hospitals, and few of the lower who have syphilitic chancre (often an insignificant-looking, painless lesion), while they run in all haste for relief for the painful, angry-looking chancroid. Finally, syphilitic chancre occurs but once in a lifetime, and rarely lasts long; while chancroid may be acquired an indefinite number of times, and may possibly in certain forms last a number of years. Hence the rule: in hospitals, chancroid far outnumbers syphilitic chancre. The same holds for the practice of the young surgeon, or for those who attend the poorer classes; while, in the higher walks of life, ulcerations about the penis will be mainly herpes, or abrasions, or balanitis, syphilitic chancre next in frequency, chancroid least common.

Methods of Contagion.—Contagion is immediate, i. e., by direct contact, as in sexual intercourse, or manipulation of chancroids with fissures or abrasions on the hand; or mediate, i. e., through some intervening agency, as by carrying the poison upon the fingers in scratching, and thus inoculating some abraded surface. The virus is fixed and not volatile, and actual contact with the pus is essential to infection. Contagion takes place in the vast majority of instances during the sexual act, but, as any abraded surface upon any part of the body is capable of absorbing the virus, cases of accidental, mediate, or immediate contagion occasionally occur, as on the finger of the accoucheur. Spontaneous auto-inoculation is common, especially where the virulent pus is retained between two tegumentary surfaces lying in contact, as beneath the prepuce.

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[1] "Dict. de Méd. et de Chir. prat."

Mediate contagion in sexual intercourse is possible. Thus, a man with a long prepuce, but no abrasions, may carry the virus from one woman and deposit it in another, with whom he cohabits at a short interval. Then washing himself, he may escape infection, after having none the less occasioned chancroid in the last-mentioned woman. The same intermediate part may be played by the sound vagina—a woman receiving the poison from one man, transferring it shortly to another in sexual intercourse, and herself escaping. This is mediate contagion. Cullerier's[1] two famous experiments on women establish beyond dispute the fact that chancroidal pus may lie for some length of time in contact with a vagina, presenting no abrasions, without being absorbed. In these experiments chancroidal pus from the groin was deposited in the vagina, the latter showing no abrasions, and its secretions being inoculated with negative result. In one case the pus was left in the vagina thirty-five minutes, in the other nearly an hour; the patients, ignorant that they were the subject of experiment, were made to walk about, closely watched. Finally, some of the vaginal secretion was again collected, and successfully auto-inoculated in both cases. The vagina was thoroughly washed out with an astringent solution, and did not become ulcerated in either case, although the poisonous pus had remained for some time in contact with its walls.

These two cases at once raise the question, Can chancroidal pus be absorbed except through an abrasion? Evidently not at once, as the two cases prove, nor probably in any length of time through the hard epithelium of the skin, for hospital patients, little careful as to cleanliness, handle with impunity their chancroids from day to day, and do not inoculate their fingers, except through preëxisting abrasions; but that the poison may enter through a mucous surface not visibly abraded is certain, whether by direct absorption, or by corroding for itself a way, has has not as yet been demonstrated; but in all probability by the latter means. In this way may be explained chancroid with a comparatively long period of incubation. A man lies with a woman having chancroid. He inspects himself after the act and finds no abrasion, but, neglecting to wash himself, pulls forward the prepuce and goes on his way. A small quantity of virulent pus remains in the little pocket alongside of the frænum, where the mucous membrane is very thin and always moist. The pus, by its acridity, destroys the superficial layers of epithelium in a few days, and then, finding a loop-hole for absorption, poisons the spot at once, and the patient appears, perhaps a week after his suspicious intercourse, with a chancroid only just commencing, the long period of incubation here being more apparent than real. In like manner a few pus-corpuscles rubbed into the mouth of a minute follicle during the friction which accompanied the sexual act could not be washed away, and by the same process of corrosion give rise to a characteristic ulcer, after a period of apparent but not real incubation (follicular chancroid).

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[1] "Quelques Points de la Contagion médiate," Mém. de la Soc. de Chir.

SITUATION OF CHANCROID.—Chancroid is rarely found far from the genitals, for the obvious reason that it is usually too conspicuous to be lightly handled, except by the accoucheur or the surgeon who has it under treatment. It was at one time supposed that chancroid could not occur upon the head or face, but now medical literature contains several cases of undoubted chancroid of the face, giving positive result by auto-inoculation, and not followed by syphilis (Bassereau, Boeck, Puche, Rofeta, and others); while syphilizers have abundantly proved that the head and face, as well as any other portion of the tegumentary expansion, may be successfully inoculated with chancroid. Boeck, however, in studying the susceptibility of the different portions of the body to the action of chancroid poison, found that inoculation produced upon the cheeks or head only small, shallow ulcerations of comparatively short duration;[1] the chest and abdomen come next, then the arms, and, finally, the thighs, which would furnish positive results to inoculation, after the latter had become impossible upon the upper portions of the body.

Chancroids upon the male genitals appear by preference in the sulcus on either side of the frænum, but may occupy any position even to the inside of the urethra, where they are occasionally found, usually occupying the meatus, and thence extending inward, or wholly concealed inside the canal. Duncan inoculated his own urethra by transporting into it some chancroidal pus. He got urethral chancroid with double bubo.[2] Ricord figures a case of deep urethral chancroid, with chancroidal-looking ulcerations of the bladder, but tubercular ulceration has been suggested to explain this unusual case. Intra-uterine chancroids in the female have been reported (Delmas and Combal). Scrotal chancroids mainly result from auto-inoculation of abrasions by discharges from some chancroid of the penis or under the prepuce. Chancroid of the anus is rare in the male. In the female, where the poisonous discharges trickle from the posterior vaginal fourchette over the anus whenever the patient lies upon the back, they are not uncommon. In the male, when not resulting from pederasty, they are rare. That chancroid may develop upon pathological as well as normal tissues is proved by the successful inoculation by Boeck and others upon elephantiasis, and by a case reported by Breslau[1] of chancroid found upon an epithelial cancer of the uterine neck giving positive results by inoculation.

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[1] But that chancroid may be occasionally severe on the head is proved by a case reported by R. W. Taylor, in Brown-Séquard's "Archives," No. 5, 1873. The article contains an excellent digest of the literature of the subject.

[2] "Cours des Maladies syphilitiques," Petit-Radel, 1812.

Symptoms.—The symptoms of chancroid may be best observed by studying the course of the artificial ulcer produced by inoculation. The smaller the inoculation the more perfect the result. It has been noticed in the large chancroids produced by inoculation of scarified surfaces that the lesion often develops from many initial centres, numerous points on the scarified surface "taking," the whole constituting a multiple chancroid, which soon unites into one. To inoculate properly, a lancet or pin should be used; the latter can always be obtained new, clean, and sharp. If a lancet be employed in any doubtful case to inoculate as a test, it should always be scrupulously cleaned before use. With the lancet, Boeck's method is the best. Scrape a little pus on the point of the instrument, hold the point at right angles to the surface of the skin, and cause it to penetrate just barely below the epidermis, then rotate the instrument, held in the same direction, half round and back, withdraw it and smear over the little red point with whatever pus remains upon the end of the lancet. Within twenty-four hours after such an inoculation, a reddish blush will envelop the puncture; on the second day the little dark speck of dried blood is surrounded by a faint, inflamed areola. Occasionally there is already commencing pustulation on the second day, usually on the third day, sometimes later. The red areola enlarges, and surrounds a vesico-pustule. Break this, and beneath will invariably be found an ulcer, a perfect, fully-formed chancroid in miniature. If left alone, the vesico-pustule becomes an ecthymatous pustule, which usually breaks in a few days after it has reached the size of a split pea. The circular ulcer which results, continuing circular, enlarges and deepens. It usually becomes stationary before it reaches the size of a half-dime, but may become as large as a silver quarter of a dollar, or occasionally far exceed it. This ulcer is a true chancroid, resembling in every minute particular the ulcer from which it sprung by inoculation, and tending to run a similar course.

It is evident, from the foregoing description, that chancroid has no period of incubation or hatching. When the virus is placed in a position where absorption is possible, it commences its work at once, and rapidly reaches the stage of ulceration. In the same way the chancroid acquired in sexual intercourse has no period of incubation, this point being perhaps of all the most important, as distinguishing it from syphilitic chancre. Usually by the third day after suspicious intercourse, occasionally as late as a week, or rarely later, where the pus has had to employ several days to corrode the epithelium before gaining access to the vascular tissue beneath,[1] a small ulcer will be found, which has the characters of a chancroid, characters which apply to a chancroid ulceration of whatever size, wherever situated, originating from natural contagion or from inoculation. These characters are: a rounded, sometimes oval margin, abrupt, perpendicular edges, looking as if they had been cut out by a sharp-edged punch, sometimes everted. The ulceration is rather deep considering its extent; in very rare instances, shallow, like herpes; the bottom is irregular, velvety, grayish-yellow, covered by a pultaceous, adherent substance resembling false membrane, or wet wash-leather, composed of partly-destroyed elements of the skin and pus, with perhaps some irregular, pale granulations. The whole is usually bordered by a pink areola. Under favorable circumstances, there is no surrounding inflammation, there is no hardness under or around the ulcer, which rests on a perfectly soft base. The suppuration is abundant, rather thick and creamy, mixed with organic detritus, not generally tinged with blood. There is little or no pain. Such a description applies to a type case which has never been irritated mechanically or chemically. This single ulcer runs through its stages of increase, stationary period, and repair, provided it is allowed rest and is not irritated, and pursues a natural course, as follows:

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[1] "Archiv der Heilkunde," 1861.

Course of Chancroid.—It increases in size for one or two weeks, preserving its characteristics, and reaching a variable size, often not larger in diameter than a quarter of an inch. Of this size it remains for a period of perhaps two weeks, undergoing no appreciable change; or there may be no stationary period, repair setting in at once after the ulcer has reached a certain size. Finally, repair is announced by a more creamy, laudable condition of the pus, a sloping of the abrupt edges, and a clearing up of the cavity of the ulcer, which becomes rosy, granular, and gradually cicatrizes from the edges toward the centre. During the whole period of its existence the chancroid furnishes auto-inoculable pus. The old theory, that after repair was well advanced the secretion ceased to be poisonous, is no longer tenable. Truly the degree of virulence is lessened with advancing repair, but Fournier has recently been able to obtain occasional positive results by auto-inoculation from chancroids which were nearly cicatrized.

This important fact, that the secretions of chancroid are contagious until the cicatrix is formed, has but two exceptions: 1. When gangrene attacks a chancroid, its discharges are not contagious, nor does the granular surface left by the separation of the slough any longer afford a poisonous secretion; 2. Certain very old chancroids, usually such as have been of considerable size, and are situated in positions where they are kept irritated and prevented from healing, perhaps for years, sometimes lose their poisonous properties finally, and become simple chronic ulcers, kept open by contact of irritating discharges, muscular contractions, and motion of the parts on which they are situated. Such ulcers are found in the anus and rectum of the male, and in the vaginæ of old prostitutes—p. 486 (*e.*).

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[1] Fournier, in a carefully-observed statistic of fifty-two cases, where the patient would acknowledge but one sexual contact for the previous four or five months, found twenty-four developed within the first four days, forty-one within eight days, others later, the sore being often quite large when discovered.

THE SCAR left by chancroid varies with the depth of the ulcer. It may be so faint as shortly to disappear, leaving no trace; or, again, may remain indelible, as a seamed and puckered, unsightly scar, of a size proportioned to the previous ulceration.

But this mild and simple sequence of events in chancroid is far from being constant. All sorts of variations from the natural type occur: in (*a*) initial form, (*b*) shape, (*c*) number, (*d*) size, (*e*) duration, (*f*) pain, (*g*) condition of base, (*h*) relapse, and finally the complications of: (*i*) vegetations, (*j*) syphilitic chancre, (*k*) inflammation, (*l*) gangrene and gangrenous phagedena, (*m*) phagedena, (*n*) bubo, (*o*) lymphitis.

(*a.*) VARIETIES IN INITIAL FORM.—Usually chancroid of a mucous membrane presents itself from the first as an ulcer, but occasionally the initial pustule may be seen. This breaks, disclosing the characteristic ulcer, or, occasionally on the skin, does not break, but dries into a scab. The scab increases in size by additions of pus from beneath, and covers the ulcer; but the pus which may be squeezed from the sides, by pressure upon the loosely-attached crust, is auto-inoculable, and if the crust be removed true chancroid is disclosed. The French call this form "ecthymatous chancroid." Again, the chancroid pustule may originate in the orifice of a sebaceous gland of the scrotum, or penis, and be mistaken readily at first for simple acne, or the lesion may resemble a small boil at its commencement (follicular chancroid). The primary lesion may be a papule surmounted by a pustule, or, still more rarely, a bulla (Fournier). These latter forms are exceptionally rare.

(*b.*) VARIETIES IN SHAPE.—The usual round or oval form of chancroid is subject to exception. If a wound be inoculated, the chancroid takes the form of the wound. So of a fissure, as is often beautifully seen in chancroid of the anus, such a chancroid being frequently multiple, standing off in rays from the puckered centre, or extending up irregularly into the gut, perhaps for several inches. Two neighboring chancroids may coalesce, producing one sore of irregular shape, with borders composed of segments of circles. The ulcer may undermine the frænum, or follow around the sulcus behind the corona glandis. It may cicatrize on one side, and advance on the other, or finally assume any variety of shape from the modifying influence of gangrene or phagedena.

(*c.*) VARIETIES IN NUMBER.—Chancroid may be unique, or any given number may coexist. Sperino, in practising syphilization, was in the habit sometimes of inoculating in eighty places at once, since he found that, by so doing, the size of the resulting ulcers was smaller. Chan croid is often multiple from the first, when several abrasions are simultaneously inoculated during the sexual act; or, starting unique, may become multiple to any extent by auto-inoculation, especially inside the prepuce; anal chancroid is usually multiple. It is not uncommon with a tight prepuce to find half a dozen small chancroids situated just on the preputial margin, or the whole rim may be one ulceration. Usually, when chancroid is multiple from the beginning, each ulcer is small.

(*d.*) VARIETIES IN SIZE.—The size varies from that of the head of a pin to enormous phagedenic surfaces, covering half the belly.

(*e.*) VARIETIES IN DURATION.—A chancroid untreated never lasts less than a month. The larger the size the slower the repair, other things being equal. Gangrenous sores may continue for months, and phagedenic serpiginous chancroids, as a rule, for many months, exceptionally for a number of years. Chancroids of the meatus urinarius, constantly irritated by urine, are very slow in getting well. Certain old chancroids of the rectum, which have partly cicatrized, forming stricture, may be kept open by local irritation, and perhaps never get well, although their secretions finally cease to be inoculable. The same may be said of certain old chancroids in the female vagina, which erode large portions of the walls of the canal and the labia, perhaps at the same time extending over the perinæum, and including the anus and rectum. These also finally cease to progress, but remain open for years, as simple chronic ulcers, not auto-inoculable, perhaps surrounded by hardened cicatricial tissue, attended by little or no pain or inflammation; perhaps resting on a hard base, looking pultaceous or sometimes dry and red without granulations. These ulcers are kept from healing by the condition of the patients, mostly middle-aged prostitutes, broken-down hospital cases, often suffering from syphilis at the same time, and by the contact of urine and the movements of the parts; the hard, unhealthy base of the ulcer proves also a decided obstacle to healthy action in the sore. This variety of ulcer has been best described by Boys de Loury et Costilhes.[1] These ulcerations in the female vagina are often mistaken for tertiary syphilitic serpiginous ulcers, especially if the patient have syphilis at the same time. The distinction is often difficult, even impossible, except by studying the history of the ulcer. Syphilitic ulcer will be found to have commenced as a tubercle, having no connection in point of time with sexual intercourse, and there will often be some tuberculization of the edges of the sore. Tubercular syphilitic ulceration, once started, may become phagedenic, just as well as chancroid; and the contact of urine, the habits of the patient, motion, the callous condition of the base of the sore, etc., may prevent anti-syphilitic remedies from exerting such a marked beneficial influence as might have been expected, so that diagnosis becomes exceedingly difficult. Should some of the poisonous secretions, however, still remain upon the ulcers, auto-inoculation, if it takes, will at once remove all doubt, and this test may be employed. A negative result, however, does not prove that the lesion was not a chancroid at its commencement, and the probability is always in favor of such a supposition. Phagedena alone does not destroy the inoculability of the discharge. Some authors describe these ulcers as a variety of lupus.

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[1] "Des Ulcerations chroniques, ou Chancres chroniques des Parties génitales de la Femme," Paris, 1845.

(*f.*) VARIETIES IN PAIN.—Chancroid may be almost entirely painless, only attended by some itchy, prickling sensations. Any irritation applied to it, however, occasions pain at once, so that clinically, instead of being absent, pain is usually a diagnostic symptom of chancroid, serving to distinguish it from syphilitic chancre. All sorts of irritating and many simple stimulating dressings are liable to cause pain, sometimes even cold water (Fournier). The position of the sore on the end of the penis, which usually hangs down, erections, which pull upon its edges, contact of urine, retention of pus on the surface, all these causes serve to inflame a chancroid and give rise to pain. In two pathological conditions pain is often very severe in chancroid, when it is attacked by gangrene, or by phagedena, and when it is advancing rapidly.

(*g.*) CONDITION OF THE BASE (INDURATION).—The chancroid when not irritated reposes upon a perfectly soft base. When irritated or inflamed, an induration is caused, sometimes slight, sometimes extensive, recalling the hardness around a boil. This is an accidental and not a natural phenomenon, and is an important distinguishing mark between chancroid and syphilitic chancre. The base of herpes, excoriations, abrasions, vegetations—in short, of any lesion about the genitals—is liable to indurate if irritated or inflamed. Sometimes this induration resembles syphilitic induration very closely, but usually it is easily distinguishable. It is an inflammatory hardness, the tissues are evidently glued and matted together, the edges of the induration lose themselves gradually in the surrounding tissues, and do not end abruptly as in syphilitic induration. There is more pain on pressure than in the latter. The induration never precedes ulceration as in syphilitic chancre, and, finally, the feel itself is different, very unlike the woody, cartilaginous, elastic feel of syphilitic induration. Besides inflammation from any irritating cause, contact of urine, friction, position (chancroid of the meatus urinarius almost invariably indurates, as do most often chancroids under a tight prepuce, which has become phimotic from inflammation), many substances commonly applied as dressings to chancroid are directly instrumental in causing hardness of the base; all caustics, acid, or alkaline, especially if applied sparingly, and perhaps most particularly nitrate of silver, solution of corrosive sublimate, or chromate of potash (Fournier). In fact, there are so many natural, accidental, and medicinal causes for induration, that it is rather surprising that any chancroids escape them all and remain soft to the end, as many of them certainly do.

(*h.*) Relapse.—A chancroid may have fairly entered the period of repair, or even be far advanced in it when, suddenly, perhaps from irritation, often without appreciable cause, it relapses, resuming all the characteristics of chancroid, and advancing a second time for a variable period. More rarely a relapse may occur a second or even a third time.

COMPLICATIONS OF CHANCROID.

Of all the complications of chancroid—inflammation, vegetations, phimosis, paraphimosis, lymphitis, erysipelas, gangrene, phagedena, simple bubo, and virulent bubo—not one is peculiar to chancroid, except the last. Each and all of the others may complicate any herpetic, simple, inflammatory, or even syphilitic lesion of the genitals, but naturally they are oftener found with the more virulent sore—chancroid. This fact must be constantly borne in mind.

(*i.*) Vegetations.—These papillary growths may complicate chancroid, as they may any other lesion (inflammatory, syphilitic, or gonorrhœal), especially of the prepuce or around the anus (for Vegetations, *see* page 21).

(*j.*) Syphilitic Chancre may complicate chancroid by appearing alongside of it, or on the same spot as *mixed chancre* (which *see*, p. 526).

(*k.*) Inflammation, spontaneous (from plethora, debility, drinking), mechanical (from friction, erection, position), chemical (from contact of urine, lack of cleanliness, inappropriate dressings), is a frequent complication of chancroid. Especially is this true when the ulcer is sub-preputial, if the prepuce be long or congenitally tight. Phimosis and paraphimosis are often encountered with chancroid, lymphitis is very liable to occur (with enormous œdema of the prepuce, perhaps of the whole penis), and possibly erysipelas, while the retained discharges and the tension of the parts predispose strongly to sloughing and phagedena. An inflamed chancroid gets painful at once. It indurates, and may become livid, its secretion grows thinner and more bloody, while its ulceration deepens. Inflamed chancroid is very liable to be attended by suppurating bubo. Abscess may form in the thickness of the prepuce, and, opening, remain indefinitely fistulous. With phimosis pus may be retained and burrow backward, sometimes in a narrow tract at the end of which an abscess forms, opens, furnishes inoculable pus, and remains fistulous. This burrowing may sometimes go on to an enormous extent. Vidal saw a case where the whole skin of the penis was separated up to the root of the scrotum. The integument of any portion of the body may undermine from retained chancroid pus, by a species of subcutaneous phagedena. In patients who are run down constitutionally, chancroid sometimes pursues a course of slow, chronic inflammation. Such an ulcer is painful, surrounded by a red areola, with perhaps a hard base and undermined border. The base looks pultaceous, discharges a thin, perhaps sanious, secretion, which often dries into a scab. Chancroids of this description may increase in size and become phagedenic or remain stationary for a long time. They are sometimes attended by paroxysms of feverishness, with symptoms of gastric disturbance.

(*l.*) GANGRENE AND GANGRENOUS PHAGEDENA.—Gangrene is a complication not confined to chancroid, as it may be engrafted upon other lesions of the penis. It is of two kinds: total (self-limiting), or progressive (phagedenic). The first-mentioned variety commonly accompanies a high degree of inflammation, as in connection with inflammatory phimosis or paraphimosis, where the tension of the parts is great, and they suddenly and in totality fall into gangrene. In this way the whole prepuce may be lost, artificial circumcision being neatly performed by the separation of the slough. The whole glans penis may slough away, or a swollen and inflamed prepuce, retaining the pus of the chancroids within, perhaps suddenly becomes blackish green over a greater or less area, a slough forms, separates, letting the head of the penis through, leaving behind a seemingly double-headed, unsightly member, the remains of the prepuce below becoming hardened, œdematous, sometimes greatly increased in size by chronic inflammatory hypertrophy. Total gangrene rarely attacks chancroid, except where the ulcers are sub-preputial.

Besides the immediate exciting cause (great inflammatory tension), the predisposing causes are any debilitating agencies, malarial or other cachexiæ, old age, alcoholism, etc. Total gangrene of the whole chancroidal surface at once destroys it just as certainly as does the thorough application of an efficient caustic. In both cases alike neither the slough nor the pus formed beneath it in the natural process of its elimination possesses any poisonous, inoculable properties. After the slough has fallen, a healthy, granulating, non-virulent ulcer is left, which usually goes on at once to repair, with rapidity proportionate to the vitality of the individual. But just as an imperfect application of caustic to a chancroid only produces a partial slough, and does not do away with the poisonous properties of the sore, since the virus is secreted by all portions alike, and if any is left the whole is repoisoned, so there may be spontaneously progressive gangrene of the phagedenic sort, attacking a chancroid not thoroughly destroying the secreting surface, and consequently not interfering with the inoculable properties of the pus. Under these circumstances a black slough forms on the surface of the sore, but it does not separate; pain continues, and a new slough forms or the old one progresses; and so on, in a phagedenic manner, sometimes slowly, sometimes rapidly, often large portions of skin and underlying tissue being destroyed before the sloughs finally separate, and leave healthy surfaces beneath. This variety of gangrene constitutes one (the less common) form of phagedena, and is responsible for many of the extensive mutilations accompanying chancroid. With forming or advancing gangrene there is intense pain, and always some general constitutional disturbance, fever, etc., which does not obtain in true phagedena.[1]

The physical signs of gangrene, when attacking a chancroid which is visible, are similar to what is observed in gangrene elsewhere. The ulcer first begins to look grayish, the patient suffering great pain; then it becomes violet, finally greenish black, while the discharge grows thin and fetid. A line of demarcation finally forms, surrounded by an inflammatory areola, and, if the slough includes the entire ulcer, its separation leaves a healthy granulating surface behind.

(*m.*) PHAGEDENA is molecular gangrene. But molecular gangrene is not able to destroy the poisonous surface rapidly enough to make the ulcer a healthy one; hence phagedena, as applied to chancroid, signifies large extension of the ulcer with preservation of its specific (inoculable) properties. Phagedena, most commonly found with chancroid, is not confined to this variety of sore. Syphilitic chancre is sometimes phagedenic (Rollet thinks only in the gangrenous form); different ulcerated syphilides and scrofulides occasionally become phagedenic.

Phagedena advances superficially, or in depth, or both at once. It is pultaceous in type, or, more rarely—as detailed above—gangrenous. The latter form, often largely destructive, is comparatively rapid; the common form (pultaceous, superficial, serpiginous, ambulant) is exceedingly slow. Phagedena advancing on one side often gets well with proportionate rapidity on the other.

Clerc has established that a chancroid never commences phagedenic, but always becomes so secondarily, after having existed for a while uncomplicated. Chancroidal phagedena seems often to be arrested by coming into contact with tissue of a different order from the one it is attacking. It shows a predilection for cellular, connective tissue, as in undermining the skin of the penis. Belhomme[2] gives a striking instance of a phagedenic serpiginous chancroid of the skin stopping suddenly on reaching the mucous membrane. This cannot, however, be always counted on, but the tendency exists, as is well shown by the fact that vessels, nerves, and glands, are often dissected out, and spared by the advancing ulceration. The corpus spongiosum, corpora cavernosa, and testicles, may be bared by phagedena, but themselves remain untouched. Fascial expansions, and fibrous tissue generally, may be expected to oppose the destructive march of phagedena; but sometimes nothing is spared, all the tissues being eaten through indifferently—by the variety of phagedena which destroys in depth (mainly by slough).

Phagedena attacks virulent bubo perhaps as often as it does chancroid. It seems, however, to spare all except virulent buboes.

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[1] Cases of this sort are not uncommon in hospitals.

[2] "Du Chancre phagédénique et de son Traitement," Thèse de Paris, 1862.

The serpiginous (*serpere*, to creep) phagedena (unlike the gangrenous form) is attended by not very great pain, and no constitutional disturbance; there may be slight headache, *malaise*, etc. As it commences, the surrounding skin reddens, the borders of the ulcer swell and undermine. The true characters of chancroid are retained by the sore throughout, the base is uneven and (sometimes with exuberant granulations) covered by the same grayish, adherent, false-membranous-looking material, whence the name pultaceous chancroid. The edges are sharply cut, gnawed, uneven, abrupt. The discharge is thin, sanious, and inoculable to the end. The edges are often undermined, thin, purplish, perhaps œdematous. Pain of a burning character at the edges indicates advance of the process.

This form of phagedena lays bare the penis, sometimes the testicles, and may travel up over the abdomen, and to any extent farther. Usually, however, the largest, most persistent chancroids originate in bubo (which see), but the characteristics of the ulcer are the same, whatever its origin. No definite duration can be assigned to phagedena. The chronic serpiginous form, untreated, always lasts many months, sometimes many years. The longest case recorded (Fournier), commencing in the groin in a virulent bubo, was still present as an open ulcer of the knee after fourteen years, having healed up behind as it advanced, and this, indeed, was not untreated, but had been under Ricord's care for several years.

The course of phagedena, like that of chancroid, may be continued by successive relapses. Perhaps after cicatrization is nearly complete, phagedena recommences without evident cause, and the whole cicatrix reopens.

The causes of phagedena are (1) general and (2) local.

1. *General.*—Whatever depresses the vital force—bad hygiene, intemperance, misery, digestive troubles (Ricord), scrofula, lymphatism, scorbutis, malaria. Chronic alcoholism and old age are prominent as general causes.

2. *Local.*—Lack of cleanliness, phimosis from retention of pus, fatty substances as dressings, particularly mercurial ointment, which Ricord considers a very active cause, all sorts of local irritation, friction, etc. Sperino,[1] Salneuve,[2] Rollet, and others, have inoculated from phagedenic chancroid, producing only simple chancroid; and Sperino, with other syphilizers, has shown that the same pus inoculated on different individuals produced in some simple, in others phagedenic sores, while confrontation—that is, examining the woman from whom the man received his sore, or *vice versa*—has frequently revealed a phagedenic sore derived from a simple one. Hence the conclusion: There is no special phagedenic virus. Phagedena is not a property belonging to chancroidal pus

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[1] "Studi clinici sul Virus sifilitico," Turin, 1868.

[2] "De la Valeur séméiologique des Affections ganglionnaires," Thèse de Paris, 1852.

it is rather a property of the tissues of the patient—an individual idiosyncrasy. This fact is substantiated by daily experience, for hetero-inoculations[1] with phagedenic pus have rarely produced more than a simple sore, while auto-inoculation of the same pus is not unlikely to be attended by phagedena. Again, certain individuals are recorded as having had chancroids on two different occasions, both times phagedenic.[2] In some instances, however, we find ourselves unable to detect any cause of phagedena, which may attack patients apparently in the most robust health, where none of the general or local causes mentioned above seem to have been at work. Treatment will be considered under treatment of chancroid.

(*n.*) Bubo and (*o.*) lymphitis will be described after the section on treatment.

DIAGNOSIS OF CHANCROID. — The diagnosis of chancroid is with herpes, balanitis with excoriations, exulcerated abrasions, syphilitic chancre, simple ecthyma, ulcerated mucous patch, ulcerated (tertiary) tubercular syphilide of the glans penis or prepuce, epithelioma (p. 22). The distinguishing peculiarities of the four most common of these lesions—syphilitic chancre, chancroid, herpes,[3] ulcerated abrasion—will be exhaustively considered side by side in the diagnostic table following syphilitic chancre. Of the others, the ulcerated mucous patch rarely presents the same depth of ulceration, or tendency to spread, and mucous patch furthermore is apt to coexist with other similar lesions of the mouth or anus. Discharge from mucous patches is in a measure auto-inoculable, but does not of course produce typical chancroid. Finally, tertiary syphilitic ulcerations of the glans or prepuce often resemble chancroid so accurately, that no physical characteristic is wanting. Usually, however, the edges are harder, as is the base, the ulceration more irregular in outline, the tendency to eat deeply more marked, the pain and inflammation less. The discharge is not auto-inoculable. With any one of these lesions there may be local inflammation and consequent suppurating bubo, or even lymphitis, but, in any case, if a bubo suppurate and its pus be found auto-inoculable, it has derived its origin with absolute certainty from a chancroid, and from a chancroid only. In any case of doubt, in presence of a suspicious sore, there remains one infallible method of diagnosis; namely, auto-inoculation.

Auto-inoculation is most safely practised in one of three situations: under the nipple, where Boeck has shown that chancroid naturally runs a mild course, over the insertion of the deltoid, or on the outer part of the thigh. In all of these localities the artificially-produced sore is not liable to be complicated by bubo, on account of the distance of the lymphatic glands, nor is it likely to accidentally inoculate surrounding parts. Of course after an inoculation has fairly taken, and served its end as a crucial diagnostic test, it should be promptly destroyed by a drop of acid. In certain cases it is absolutely impossible to arrive at a diagnosis without consulting this test, as where the chancroid cannot be seen—sub-preputial chancroid with phimosis, intra-urethral chancroid, anal chancroid resembling fissure. In intra-urethral chancroid, the auto-inoculability of the pus is sometimes the only diagnostic symptom; in other cases there is a painful spot in the urethra during erection, and a lump that may be felt from the outside; possibly virulent bubo accompanies it, or, in rare cases, there may arise a peri-urethral abscess in connection with urethral chancroid. Such an abscess opens, furnishes auto-inoculable pus, and remains fistulous (Ricord, Hélot).

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[1] Inoculations upon one individual from another.

[2] Negroes suffer more than whites from phagedena, as indeed they do from chancroid, bubo, syphilis, or even gonorrhœa as a rule.

[3] Legendre (" Mémoire sur l'Herpès de la Vulve," Archiv. de Méd., 1853) has brilliantly described the difficulty of diagnosis in some of these cases in the female.

Successful auto-inoculations have been made with pus, derived from irritated syphilitic chancre, secondary lesions, especially mucous patch, or in suitable subjects may sometimes be made with pus, from gonorrhœa, simple abscess, fluid around vegetations, pus from a pustule of scabies, etc., and even a pustule may be produced, by simply scratching the skin of certain individuals with a clean, new lancet, going through the motions, but inoculating nothing. Pustules and ulcerations produced by any of these methods need not lead to error. They are not chancroids, and never have been proved to be such, through the production of characteristic chancroid by their hetero-inoculation. And, indeed, even in the first inoculation of these fluids, the chancroidal ulcer, as above described, cannot be produced. An ulcer, indeed, may form, and an ulcer whose pus may be feebly auto-inoculable, if the patient be in a condition favorable to suppuration, but the pustule is usually an abortive one, tending to dry up and scab, the ulcer is small, does not spread like chancroid, nor does it possess the well-known characteristics of the latter. Syphilitic chancre is only auto-inoculable after it has been irritated and made to suppurate freely, and so of the other substances mentioned above; the thicker the secretion is in pus-corpuscles, the more likely is it to occasion a slight ulceration by auto-inoculation, sustaining Van Roosbroeck's theory of the contagious properties of all pus. Then, on the other hand, in certain individuals, any scratch, however made, will fester and produce pus, but it would be difficult to confound such an ulceration with chancroid. In short, these cases of exceptional auto-inoculability of other secretions than that of true chancroid will rarely lead to error. They may serve to feebly uphold preconceived theories, but not to deceive the earnest searcher after truth. The real error to which the well-informed student is exposed, is that of inoculating from the secretion of a chancroid, which has been gangrenous, and deciding against chancroid, because the inoculation did not take, and perhaps, on this account, concluding that his patient has syphilitic chancre, or making the other error of inoculating from a mixed sore,[1] and wrongfully deciding that there is no syphilis because auto-inoculation takes. Hence the caution to be remembered: chancroids attacked by total gangrene are no longer inoculable, and an ulcer reproducing itself by inoculation may possibly be a mixed sore. Another caution is equally important: only practise auto-inoculation of a phagedenic chancroid under the nipple of a patient. There is always a chance that the new sore, produced upon a subject already predisposed to phagedena, may itself take on the same morbid action, but the chance is less under the nipple than anywhere else, except on the face.

Prognosis.—Chancroid does not endanger life, except very occasionally, from such complications as severe erysipelas, or extensive, sloughing phagedena, by opening a vessel or exciting peritonitis. Practically it may be said that chancroid does not kill; even the immense chronic ulcers of serpiginous phagedena eventually get well.

Certain results of chancroid, however, must not be forgotten. Extensive cicatrices left by phagedena may prove annoying by their subsequent contraction, and the actual destruction of the penis by phagedena practically unsexes the man. Then urethral chancroid is inevitably followed by more or less stricture of that canal at the seat of the lesion. So, also, may permanent phimosis be produced by the cicatrices of chancroidal ulcerations at the orifice of the prepuce. Chancroids of the pockets on either side of the frænum may, but very rarely do, eat into the urethra, and result in artificial hypospadias. Extensive adhesions of the prepuce to the glans penis may occur after chancroidal phimosis, as indeed after the simple inflammatory form.

CHAPTER II.

CHANCROID.

Prophylactic Treatment.—Local Treatment of Chancroid.—Local Treatment of Phagedena.—General Treatment of Chancroid.—Bubo; simple; virulent.—Treatment of Bubo.—Lymphitis; simple; virulent; syphilitic.—Treatment of Lymphitis.

Prophylactic Treatment.—As a rule, chancroid does not come under the surgeon's notice until it is already advancing and beyond the reach of any abortive measures other than actual destruction by caustics. But, on the other hand, it not infrequently happens that a crack or abrasion on the surgeon's finger becomes inoculated in handling chancroids, and then any prophylactic treatment short of caustics becomes valuable. Abortive treatment applied to chancroids naturally acquired is not as effective as against the same produced artificially by inoculation. All the stronger mineral and some of the vegetable acids, caustic alkalies, and certain salts—as the sulphate of iron, chromate of potash, in solution in water, so weak as not to attack the epidermis—prevent the development of the chancroid if applied over the artificially inoculated point for a considerable time—about two hours—within a period of three to six, and occasionally twelve to twenty-four hours after inoculation has been practised (Rollet). The longer the time which has elapsed after the introduction of the poison the longer must the preventive solution be locally applied to render it inactive, and, naturally, if any portion (as by oblique puncture) has been introduced beneath the epidermis, this epidermis must be removed in order to allow the fluid to exert its power. According to Rodet and Rollet, a concentrated solution of citric acid yields the best results.

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[1] Inoculation of a preëxisting tubercle-papule, or syphilitic ulceration, with the pus of chancroid, as well as mixed chancre, should be remembered as possibilities.

Treatment of Chancroid.—Once present in its character of true chancroid, no treatment yields as satisfactory results as the entire destruction of the ulcerated surface by an efficient escharotic, thus artificially imitating Nature, which sometimes at once destroys the poisonous character of the sore by total gangrene of the secreting surface. Any active caustic may be used, but among them three hold the most prominent places, as being easily manageable and least painful; these three are: nitric acid, sulpuric acid, and the red-hot iron. The latter is often objectionable as greatly exciting the patient's fears, but indeed needlessly so, for the actual cautery is perhaps the least painful of all; the idea, however, is repulsive to a patient. The caustic alkalies deliquesce, and are unmanageable, besides paining more than the acids; the latter remark holds good of the Canquoin, Vienna paste, etc. In applying a caustic, every portion of the sore should be thoroughly and absolutely destroyed, and all existing sores, should there be more than one; for, should any ulcer secreting virus be left active, it will speedily reinoculate the raw surfaces left by the separation of the eschars, and the result would be other chancroids, by auto-inoculation, larger than those first operated upon. Hence the rule: If cauterization be decided upon, burn every portion of every ulcer, no matter what its size. If there be sub-preputial chancroid, with phimosis, the folly of burning chancroids of the preputial rim is at once apparent. The same may be said of burning sores on the glans, or prepuce, if urethral chancroid exist.

To apply nitric acid, all that is necessary is to clean off and dry the ulcer, and place upon its surface a drop of nitric acid, with a match or glass rod, holding the surface exposed until the drop has partly dried or until the pain has nearly ceased; then, to insure success, again to dry off the surface and apply a fresh drop. It is necessary to have a moistened sponge ready to absorb immediately any portion of the acid which may be running over upon the sound skin. Finally, the surface is washed, dried, covered with dry lint, and left to itself. The eschar begins to separate in a few days, leaving a red, healthy ulcer, which may be dressed with dry lint, or with any of the mildly-stimulating lotions recommended for balanitis (p. 20); and, in a variable period, depending upon the size of the ulcer and the depth to which it was burned, cicatrization will ensue. Sometimes, when sub-preputial chancroids are burned, if the prepuce be tight, inflammatory phimosis may be occasioned, unless the patient keep at rest after the cauterization.

Sulphuric acid is best applied as the carbo-sulphuric paste of Ricord. This is formed by making a paste of pure sulphuric acid, with pulverized vegetable charcoal. It is applied upon the dried surface of the sore, and pressed down into all its inequalities with a wooden spatula. It dries on as a black crust, which separates after several days to leave a healthy, granulating, simple ulcer; or, more rarely, cicatrization goes on to completion under the scab.

In using the hot iron, its point should be carried down into every portion of the ulcer, until a black dead eschar of the whole surface is produced. Cold-water dressing is applied afterward, and anodyne given until pain has ceased.

All chancroids might be cured by this simple method of treatment, rest, cold, and astringent lotions being used afterward, to combat inflammation. Healing chancroids, however, need not be cauterized, nor should sores of the meatus urinarius be burned, nor very extensive ulcerations, except as a last resource, nor chancroids which are largely multiple, both on account of the uncomfortable degree of inflammation apt to be provoked, and the greater liability to leave some little secreting surface undestroyed, which may reinoculate the burned surfaces.

Of the three agents for destroying chancroid, nitric acid is the best. It is the most manageable and least painful (Canquoin) to the patient. It destroys only a limited depth of tissue, but yet enough for the purpose, if it be properly employed. No anæsthetic is required ordinarily in applying nitric acid or the carbo-sulphuric paste. With the actual cautery it is necessary.

When it is unadvisable to use caustic, or when the patient refuses to submit to the application, the surgeon is still possessed of remedies suitable to the disease.

It is well to remember that greasy local applications to chancroids are bad. They become rancid, and prevent the escape of the poisonous pus. Mercurial ointment is believed by Ricord to be of all the most harmful. Perhaps the best treatment for simple, uncomplicated chancroid, when not destroyed by caustic, is to cover the entire surface with powdered iodoform. The local action of this drug in chancroid is superior to any thing short of cauterization, but there are two objections to its use, namely, complaint of pain occasionally from sensitive patients,[1] where a considerable surface is covered, and the very penetrating, rather disagreeable odor of the remedy. The second objection may prove the most serious one, and patients may refuse to use the powder. In such a case, the simple application of a little dry scraped lint, often renewed, so as to absorb the pus as it flows, is a fair treatment. It keeps the parts clean, and allows the sore to run its natural course, and get well in due time. Another good expedient is dusting the surface with dry, powdered oxide of zinc, or calomel with a little camphor, or bismuth, and covering the whole with lint soaked in a weak solution of aromatic wine, one part to three of water, or alcohol, one part to two of water, or permanganate of potash, gr. j–ij to the ℥ j, or carbolic acid, one-half of one per cent. It is sometimes useful even to large surfaces to apply pure carbolic acid every other day, or a solution of bromine, ʒ ij to the ℥ j, dressing between-times with one of the above solutions. Such dressings should be frequently changed, as cleanliness is of the first importance. In the treatment of any chancroid, especially such as are situated near the frænum, where the lymphatics are most abundant, rest is of the greatest utility in preventing inflammation and the formation of suppurating bubo. For chancroid of the meatus, nothing is better than a little plug of dry lint, sprinkled with iodoform, and patience, with an alkaline diuretic, to render the urine less irritating, and the absolute avoidance of any sexual excitement or erotic thoughts calculated to stimulate erection. Urethral chancroid may be benefited by the same general means and the occasional injection of a mild solution of aromatic wine in warm water.

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[1] A dilution of the powder with one-third of tannin is said, by Dr. C. C. Lee, to render the application painless.

Sub-preputial chancroid requires no modification in treatment, unless there be congenital or inflammatory phimosis. The prepuce, however, should not be dressed back, for fear of paraphimosis. With phimosis frequent injections of the balano-preputial *cul-de-sac* with warm water are necessary for cleanliness, and to prevent the pus from accumulating and burrowing. After the washing, any of the above-mentioned stimulating lotions may be injected, or a gr. v–xv solution of the nitrate of silver (Ricord), which, according to this surgeon, acts also as a local anæsthetic.

For simple or erysipelatous inflammation of chancroid, the best treatment is absolute rest, and an elevated position of the organ, aided perhaps by a lotion of lead-water externally. Where the inflammation runs high, with phimosis, and the tension of the prepuce becomes very great, it should be slit up on the dorsum, or entirely cut away (circumcision), if it be very redundant. When the pus issuing from beneath the inflamed prepuce begins to smell badly, the indication is to cut at once to avert gangrene or phagedena. Truly, the cut surface nearly always becomes inoculated, in spite of the best precautions, but, if gangrene or phagedena be averted, the extent of simple chancroidal ulceration is comparatively of small importance. When the prepuce is slit up, it is advisable to cauterize at once all the chancroidal ulcerations exposed, and the cut surfaces as well. For this purpose the hot iron is best, as the patient is under the influence of ether.

In the treatment of chancroid it is always advisable to keep the ulcerated surfaces, if possible, covered with lint or some substitute, to absorb the pus as it flows, and protect the parts which would otherwise lie in contact with the diseased surface and run the risk of inoculation.

In anal chancroid the merits of each case must decide whether it is allowable to employ cautery (hot iron). The greater the amount of tissue destroyed, the greater the degree of subsequent stricture. If an infected fistulous tract exists in connection with any chancroid, the latter should not be cauterized unless the former can be slit up, and similarly dealt with.

Gangrene, not phagedenic, should be left unmolested. The fall of the slough may be hastened by the application of a poultice of camomile-flowers (Hammond), to which a little permanganate of potash or liquor sodæ chlorinatæ may be added as a disinfectant, or some powdered charcoal, or yeast. Simple dressings for the healthy ulcer beneath are all that is required.

Chancroid of the pockets beside the frœnum frequently undermine the latter, which, when very thin, may be accidentally ruptured, giving rise sometimes to considerable hæmorrhage from the artery of the frænum. To anticipate this, it is advisable to pass a double thread beneath the frænum, and tie both ends, letting the ligatures cut through. Where the prepuce is short, and there is much œdema about the frænum, looking toward paraphimosis, the repeated judicious application of collodion to the swollen skin (after drying it) may prevent the latter complication.

Where paraphimosis has come on, if it is reducible, or irreducible, without strangulation, absolute rest, collodion, and evaporating lotions, are called for; if there be irreducible paraphimosis with strangulation, the knife must be used to avoid gangrene.

Local Treatment of Phagedena.—The proper local treatment for phagedena is unsparing cauterization, effected by the free and careful use of nitric acid, the hot iron, or the carbo-sulphuric paste pressed well down into all the sinuosities. Success depends entirely upon the destruction of the whole secreting surface, and the previous preparation of the ulcer has a great deal to do with the result of treatment. All sloughs, overhanging edges, and bridges of skin, must be cut away, fistulæ laid freely open, as well as all sinuses and pockets, in which matter may have collected. Ether should be given in the case of large sores, since slowness and care are absolutely essential to success; finally, when the wreck is cleared off; the surface should be dried as thoroughly as possible, and then the escharotic which has been selected applied with scrupulous care. Some morphine under the skin will tide the patient over the pain of the caustic. It is better to burn too much the first time, than to have to repeat the operation; the caustic will destroy less tissue than will a few days of natural advance of the ulcer left to itself, so that destruction of tissue is actually economized by judicious use of the caustic, even where the operation has to be repeated, which unfortunately is often necessary in bad cases. The indication for a second cauterization is furnished by the general appearance of the ulcer, or a return of the old pain, so characteristic of advancing phagedena, and which ceases after thorough cauterization. Erysipelas or other inflammatory complication is rarely lighted up by cauterization, an operation which, though severe in appearance, the experienced surgeon learns to regard with increasing favor.

When phagedena has attacked a virulent bubo in the groin, and in the large ulcer are found several lymphatic glands, undestroyed by the phagedena, riding out from its base, it is better to remove these before resorting to cauterization.

Sometimes these active local means cannot be employed, as where large vessels are exposed by the ulceration, when long and deep fistulæ exist, which cannot be thoroughly or safely acted upon; when the ulcer is exceedingly large, and the patient's condition will not warrant the application of caustic to so extensive a surface. Here other local applications are called for. Ricord considers a solution of the tartrate of iron and potash, gr. xx–xl to the ℥ j, almost a specific for chancroid, especially its phagedenic form. Carbolic acid may be used pure (but not over too large a surface, for fear of poisoning) every other day, the half of one per cent. solution being kept constantly applied. Bumstead mentions some successful cases by Hinkle from the use of permanganate of potash (ʒ j ß to the ℥ j), put on every two hours, a solution of gr. x to the pint being constantly applied. Iodoform in powder is an excellent local application for phagedena. Erysipelas complicating phagedena sometimes on retiring leaves the ulcer in a healthy condition of repair.

Phagedena of the anus and rectum is rarely in a position to be burned. The surfaces must be kept separated, and the parts cleaned by syringing; enemata being given for every movement of the bowels. Subsequent stricture is combated by the careful use of bougies. The worst cases may call for lumbar colotomy. The old chronic sores left behind by phagedena in the femalevagina—p. 486 (*e.*)—are perhaps best managed by a free application of the actual cautery, with subsequent absolute rest and cleanliness, and tonic internal treatment. They are usually particularly obstinate. Bumstead speaks of the good effects of powdering the surface several times daily with persulphate of iron. During treatment the parts should be kept separated by pledgets of oakum. These cases are rarely seen except in broken-down prostitutes, old hospital cases.

General Treatment of Chancroid.—Chancroid is a local ulcer. It does not in any manner affect the constitution, but the constitution of the individual affects it, rendering it, perhaps, very slow and chronic in its course; or, from personal idiosyncrasy, phagedenic. Simple chancroid, then, requires no internal treatment, except such as is suggested by common-sense, and general hygiene. Mercury rarely fails to do absolute harm and to retard cure, perhaps even to induce phagedena. Chronic sluggish cases, which fail to respond to local treatment, unless the trouble lies in the mechanical irritation of motion, may be brightened up and started toward cure by all known tonic means; among which, change of air, cod-liver oil, and preparations of iron, hold the first rank. Phagedena being nearly always a constitutional, individual tendency, requires the active use of the last-named means, with good food, and perhaps wine. Ricord speaks highly of the tartrate of iron and potash internally. It may be given in gr. xx doses. Rodet praises large doses of opium as a means of cure.

(*n.*) Bubo (*βουβὼν*, *groin*) is a term which originally applied only to certain morbid conditions of the glands of the groin. It has, by modern usage, been adopted for inflammations or simply enlargements of these organs occurring anywhere in connection with lesions usually but not necessarily venereal. There are three distinct varieties of bubo: the simple inflammatory, including all the previous stages of engorgement; the virulent, the pus of which is auto-inoculable, producing chancroid; and the syphilitic. Of these, the second is and can be found in connection with no other conceivable lesion than chancroid. Its presence is absolute proof of the preëxistence of that form of ulcer. Syphilitic bubo, on the other hand, cannot exist unless the patient have syphilis. Simple inflammatory bubo, very common with chancroid, occurs also sometimes with any inflammatory lesion, gonorrhœa, syphilitic chancre occasionally, herpes, balanitis, or indeed may develop spontaneously. Pure syphilitic bubo does not suppurate, simple bubo usually does, but may not; virulent bubo necessarily does. Syphilitic bubo will be considered in connection with syphilis.

The diagnosis of bubo is simplified by its arrangement in the Diagnostic Table, Chapter IV.

Bubo does not necessarily occur in the groin. It appears in glands which receive the lymphatic trunks distributed to that portion of the body where the exciting cause (chancroid) occurs. It may be found in the axilla, in the epitrochlear gland, under the jaw, or elsewhere. It is most frequently encountered in the groin, because its exciting cause is usually situated on the penis. Bubo is more common in the male than in the female. Fournier believes that it occurs with chancroid, about once in three cases. The proportion between simple and virulent bubo is unknown, as no statistics have been compiled. Simple bubo is happily more common. The most usual seat of bubo is in the central gland or glands of the inguinal chain, those lying over the great vessels. Bubo is single or double, usually on the same side with the lesion (chancroid) or on the other side (crossed) or double for a single sore; sometimes in double bubo, simple bubo will exist on one side and virulent on the other. Bubo only affects the first group of glands receiving the lymphatics from a part, there is no implication of glands further on, either in the case of simple or virulent bubo. Bubo, simple (sympathetic or inflammatory) or virulent, may appear early or late in the course of chancroid, even after the latter is nearly or quite healed. Simple bubo usually appears earlier (before the thirteenth day, Hairon[1]) than virulent bubo, although the latter, when it does commence, advances more rapidly. Puche[2] saw a virulent bubo come on after three years' duration of a serpiginous chancroid. Both forms of bubo are a little more commonly found with chancroid near the frænum, where the lymphatics are numerous and large. Both forms may be attended by granulations upon the ulcerated surface, constituting so-called vegetating bubo.

Simple Bubo.—This is the form commonly known as sympathetic bubo. It is essentially the same inflammatory glandular swelling as occurs after vaccination, or from an inflamed corn. Any inflammatory lesion of the penis may be accompanied by such a bubo (single or double) in the groin. Chancroid is the most common exciting cause, and especially chancroids which are inflamed. Bubo may occur without any visible causing lesion.

Symptoms.—The patient in walking feels a little pain in the groin, and thinks he has "strained" himself. On examination, he finds a small, oval swelling, perfectly movable under the skin, but painful on pressure. If properly managed, this may extend no farther, but usually the lump gradually grows. It becomes adherent to the skin at one or more points. The cuticle grows red, feels thick and porky, perhaps gets œdematous; finally, a central spot of softening may be detected; the skin becomes thin and shining; the bubo at last, like any other glandular abscess, bursts, discharges a creamy pus, and, after flowing for a few days or weeks, gradually contracts and gets well. The healing of bubo is very apt to be indefinitely postponed, in consequence of the motion to which the part is necessarily subjected in walking, every step opening the wound, and pulling upon the young granulations which are vainly trying to fill the cavity left by suppuration. Especially is this the case in feeble, broken-down constitutions, sickly youths, those who persist in drinking. Suppuration of simple bubo does not necessarily occur, and at any period, even after matter is formed, resolution is possible, but the majority open in spite of all efforts.

While abscess is forming, the ordinary constitutional symptoms exist. Pain, generally present, is sometimes wanting, but always increases as ulceration becomes imminent, and is generally greatly aggravated by motion. The formation of pus is frequently announced by chill, and attended by febrile phenomena.

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[1] Quoted by Rollet.

[2] Ricord, "Leçons sur le Chancre." Fournier.

Now, this simple glandular abscess is subject to variations in its course. With strumous patients, usually several glands swell on both sides, and become matted together into a vast lump. These grow slowly, often without pain. They are particularly sluggish, and show very little tendency to suppurate. Their pressure inflames the skin, which may get red, thick, porky, often threatening ulceration at different points. The return circulation from the scrotum and penis is often obstructed, leading to œdema of these parts. Finally the inflamed tissues around the glands break down into pus, which, when discharged, is thin, watery, sanious. The breaking of the abscess under these circumstances does not materially diminish the size of the tumor, for the peri-glandular tissue has suppurated, and not the glands. The skin now gets thinned over the swelling, the opening from which the pus was discharged enlarges, perhaps one of the glands breaks down into suppuration, or it may protrude through the opening, covered by pale, flabby granulations. The pus may burrow along the groin, over the crest of the ilium, down the thigh, over the abdomen, into the scrotum, and new abscesses form at the blind ends of these canals, which opening, fistulous tracts are left, marked by a hard, cordy feel under the skin. The discharge of serous pus from these fistulæ continues sometimes interminably. Instead of suppurating, strumous bubo may remain for months in a condition of almost painless, indolent enlargement.

Again, simple bubo may be complicated by erysipelas or gangrene, but probably never by phagedena.

The pus of simple bubo is not auto-inoculable.

VIRULENT BUBO.—This form is often known as the bubo of absorption, since some of the peculiar chancroidal poison must be absorbed in order to produce it, whether by ulceration into a lymphatic trunk, or by migration of pus-corpuscles, is unknown. Without chancroid its existence is impossible. Virulent bubo is usually single, in one gland, on one side. It suppurates necessarily, but, until it is open, there is no diagnostic feature which can positively distinguish it from simple acute inflammatory bubo, on the road to suppuration. This only can be said, that its course is more rapid, more acute, more inflammatory. Peri-adenitis occurs with virulent bubo also, the pus forming outside the gland usually ulcerating through the skin first. In such case the first pus that flows is simple, not poisonous, and the wound looks like that seen with simple bubo, but soon the deeper pus from the gland appears, poisons the wound, and gives it the well-known chancroidal aspect, and now the pus is freely auto-inoculable. Virulent bubo may discharge by a single opening. This is large at first, and subsequently enlarges, but, if, fortunately, adhesive inflammation has agglutinated its edges to the surrounding underlying tissue, no further poisoning takes place, the abscess assumes all the character of a true chancroid (abrupt edges, pultaceous, irregular base), passes through its regular stages, and finally gets well. Matters do not, however, always eventuate so fortunately, the thinned skin over the suppurating gland may fail to become bound down by adhesive inflammation, or to give way speedily at a single point, then the pus undermines a certain extent of integument, and perforates it in a cribriform manner. Burrowings, more or less extensive, go on. Hard, sinuous, everted edges, overhanging flaps and bridges of thin, purplish skin, long fistulous tracts, and poisoned pouches full of pus, serve indefinitely to prolong the virulent bubo, making its duration a matter of months, perhaps years.

Finally, virulent bubo, like any other chancroid, may be attacked by phagedena, or any of the other complications set down for chancroid (p. 488). Accidental auto-inoculation of the skin of the abdomen or thigh is not uncommon. The worst forms of phagedena are seen in connection with virulent bubo. The case which Fournier records as having lasted fourteen years and being still unhealed at the knee was phagedena of a virulent bubo. All the varieties of phagedena are found, but the pultaceous, serpiginous variety is most common. It usually travels up over the abdomen, but if very extensive seems to prefer to turn the flank and go down the thigh, rather than advance upon the chest, that region shown by Boeck to be unfavorable soil for chancroid. Phagedena does occur on the chest, but not commonly.

The nature and character of phagedena have been described. A phagedenic bubo does not necessarily, or indeed usually, exist in connection with a phagedenic chancroid, which latter may be attended by simple bubo, or leave the glands untouched; nor is lymphitis necessary, or indeed common. An insignificant-looking chancroid may be attended by a phagedenic bubo, and phagedenic chancroid may have no bubo at all.

DIAGNOSIS.—The diagnosis between simple, virulent, and syphilitic bubo, will be found in the diagnostic table following syphilitic chancre. The *bubon d'emblée* does not exist in the sense originally attributed to the term; namely, a bubo without antecedent venereal ulcer, ushering in syphilis, and furnishing auto-inoculable pus. The absurdity of this is self-evident, for a virulent bubo never ushers in syphilis, nor indeed has it any thing to do with that disease. It is nothing more nor less than a chancroid. A bubo, however, may suppurate in the groin without necessarily any antecedent chancroid, as in connection with herpes, gonorrhœa, balanitis, an inflamed corn; or spontaneously, as may a gland in the neck or axilla; such a bubo, however, does not furnish poisonous pus. When a gland in the groin suppurates, and its pus is auto-inoculable, it has been preceded by a chancroid. The latter may have cicatrized before the patient presents himself, perhaps was situated in the urethra, or even in the rectum, but somewhere it is or certainly has been. The intelligence of the surgeon may occasionally be taxed to find it.

There are no diagnostic signs between a simple and virulent bubo at first. When opened spontaneously or by art, the outlet does not enlarge in simple bubo; in virulent bubo it does, and shows all the characteristic marks of chancroid. Again, if suppuration can be arrested in an inflamed gland, it must have been simple bubo (unless syphilitic); virulent bubo must necessarily suppurate.

Treatment of Bubo.—The preventive treatment of bubo is rest, and the avoidance of such causes as tend to inflame the chancroid. The most positive preventive treatment is the absolute destruction of the chancroid with caustic. In such a case if the simple ulcer left by the fall of the slough is still able to excite a simple bubo, yet virulent bubo and its attendant phagedena can no longer occur, tincture of aconite and of iodine locally are of little use without rest; the successes attributed to them are largely coincidences. They perform one service, however—they give the patient something to do; they keep him from incessantly handling the part to see how matters are progressing. Mercurial ointment spread upon lint may be laid on the surface for the same purpose; but all substances to be rubbed in are harmful, since friction is bad. Rest in bed and a very light poultice will usually disperse a bubo better than any of the above methods.

Besides rest, there are three other agents which may avert suppuration:

1. Blister, repeated as soon as the skin has reformed.
2. Pressure, which, if applied early and judiciously in mild cases, is sometimes effective.
3. Leeches, plentifully applied around the swollen gland.

The latter treatment is only applicable in the early stages of bubo, for, should the swelling prove virulent, suppuration is inevitable, and, if the leech-bites are near the point of opening and have not cicatrized, they are pretty sure to become inoculated and form so many chancroids. If the tendency to suppuration advance very slowly, the bubo is certainly simple; if rapidly, large, hot poultices should be constantly applied to hasten it, and the abscess may be allowed to open itself; but, if, from its very rapid course, it is believed to be virulent, an opening should be made as soon as any fluctuation can be felt, to let out the poisonous pus, and save destruction of tissue. In this way burrowing may be averted, as it may also by properly-applied pressure. It is a good rule to open early in any case. If it be simple bubo, no harm is done; if it be virulent, the chancroidal ulcer following is by so much less extensive. Small collections of pus should be punctured, large ones extensively laid open. If the skin does not appear to be adherent, some caustic paste may be preferred to incision. If any outside wounds exist (leech-bites) at the time of opening bubo, they should be carefully protected. Once open, if the bloody, thinnish, unhealthy look of the pus suggest virulent bubo, the poultice should be discontinued, otherwise it is better kept up for some days. All cavities, if large, should be thoroughly cleansed several times daily with warm water, and then injected with a mild solution of carbolic acid or permanganate of potash, dilute alcohol, or some other detergent lotion. After virulent bubo becomes an open ulcer, its treatment is that of chancroid. Where large glands lie out in the ulcer and have not suppurated, or if all the suppuration have come from peri-adenitis, in cases where the bubo was strumous, these glands should be removed. This is best done with the finger, tearing them away, or they may be tied off with a ligature. Even when cut away they rarely bleed much.

Burrowing and phagedena in the groin are treated in the same manner as when occurring with chancroid. The pastes, carbo-sulphuric and Vienna, are well suited to phagedena in this region. Where suppuration has been stayed, and in all cases of chronic bubo in which strumous degeneration of the gland plays a large part, resolution may be hastened by counter-irritants and pressure. The latter is conveniently applied, the patient being on his back, by placing a bag of sand or fine shot over the swollen glands, or by a spica bandage over compressed sponge laid upon the swelling, the bandage afterward being slightly moistened. Trusses are too irritating, but it has been noticed that persons wearing trusses and afterward getting chancroid rarely have bubo upon the side of the hernia, probably from previous atrophy of the gland through prolonged pressure (Ricord). Of counter-irritants mild repeated blistering is perhaps best. Tincture of iodine has positive resolving power in this stage. Punctate cauterization is well spoken of by Fournier. It consists in touching the skin in fifteen or twenty places over the tumor with the hot iron, repeating the operation every eight or ten days; no scars are left.

Internal remedies for chronic and phagedenic bubo are the same as for similar conditions of chancroid.

(*o.*) LYMPHITIS,[1] or inflammation of the lymph-vessel, never occurs without some accompanying inflammation of the connective tissue around the vessel, peri-lymphitis. Its varieties are identical with those of bubo; namely:

1. Simple inflammatory lymphitis, which may be found in connection with any inflammatory abrasion, simple, chancroidal (most common), or syphilitic (least common).
2. Virulent lymphitis, only found in connection with chancroid.
3. Syphilitic lymphitis, found only with syphilis.

The first two varieties are indistinguishable until they suppurate.

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[1] The term "lymphitis" is critically incorrect, signifying, as it does, inflammation of the lymph. General usage, however, justifies its employment, since it is shorter than the more accurate term "lymphangitis"—inflammation of a lymph-vessel—synonymous with angioleucitis—inflammation of white vessel—first employed by Velpeau.

One or two hard, knotty cords are felt under the skin of the penis, usually at the side. They commence at the chancroid (or other lesion), extend for a greater or less distance up the penis, sometimes up to the glands in the groin. Occasionally they can be felt only toward the root of the penis. The integument over them, in mild cases, is unaltered; in severer cases their course is marked by a red line. They are painful to the touch, and during erection. The penis is often red, erysipelatous, swollen, œdematous, and, in severe cases, there are fever, sleeplessness, etc.

Lymphitis terminates in resolution or suppuration. In virulent lymphitis, the latter is inevitable. In the simple form suppuration may occur in one or more spots, resulting in abscesses, which discharge and get well. In virulent lymphitis similar abscesses form along the line of the vessel, open, furnish auto-inoculable pus, and remain as chancroidal ulcerations.

Either form may exist without bubo, with simple bubo, or with virulent bubo. The affection is not common, and bubo is most frequently encountered without it.

Treatment.—Rest, cooling lead-water or spirit lotions, collodion for excessive œdema, perhaps puncture, poultice for severe pain, and opening abscesses, when they form, comprise the treatment. Simple abscesses are best treated with water-dressings; virulent abscesses exactly like chancroids, which indeed they are. Internal treatment has no influence over lymphitis.

CHAPTER III.

SYPHILIS.

Nature.—Unity and Duality.—Length of Time required for Absorption of Virus.—Analogy with Vaccine Virus.—Second Attacks of True Syphilis.—Transmissibility to Animals.—Incubation of Syphilitic Chancre.—Induration, parchment-like, split-pea, diffuse.—Ulceration.—Secretion.—Pain.—Nature of Scar.—Auto- and Hetero-Inoculation.—Vaccinal Syphilis.—Multiple Inoculation.—Fluids capable of transmitting Syphilis by Inoculation.—Methods of Transmission of Syphilis.—Duration of Chancre.—Number.—Size.—Situation.—Form.—Symptoms of Urethral Chancre.—Course of Chancre.—Complications.—"Mixed Chancre."—Transformation into Mucous Patch.—Phagedena and Gangrene.—Treatment of Chancre.—Syphilitic Bubo.—Lymphitis.

Syphilis is a general dyscrasial blood-disease caused by the absorption of a peculiar virus into the circulation, manifesting itself primarily by the appearance of a poisonous sore at the point where the virus entered, and afterward by a succession of morbid manifestations occurring at longer or shorter intervals—manifestations which, in their totality, interest every organ and tissue in the body.

The virus is only known by its effects. Exactly what it is, has not yet been determined, either by the microscopist or chemist. Different observers have claimed to have discovered certain vegetable spores in the secretion of syphilitic chancre and in syphilitic blood, but their investigations and conclusions have been disproved, and cannot be accepted. The last effort in this direction is the discovery in syphilitic blood, by Lostorfer, of certain peculiar microscopic bodies, which he believed to represent the syphilitic poison. Further investigation, however, showed that the blood of any cachectic hospital patient, and even of healthy individuals, would furnish the same bodies, thus proving that they were not syphilitic corpuscles, and ending a charming delusion.

Diday[1] has called attention to the fact of an apparent antagonism between the syphilitic virus and cancer. Numerous inoculations in one case of syphilitic chancre, in others of secondary lesions, made upon patients with cancer by Diday, Rodet, and Rollet, have failed invariably[2] (Rollet).

Syphilis has been happily compared by Hutchinson[3] to the contagious exanthemata, small-pox, measles, scarlet fever, as possessing all the peculiar characters common to this group of diseases, namely: it is communicated only from one diseased person to another healthy one; it has a stage of incubation before any sign of the disease appears; it has a stage of efflorescence, which indeed in syphilis is prolonged and marked by relapses; it has a period of decline, and sequelæ—the later tertiary lesions—which do not always occur, and during which the disease often ceases to be communicable. Again, most of the various efflorescences of syphilis, like those of the other exanthemata, tend to pass away spontanteously after a time; thus, as Fournier aptly puts it, affording a triumph to every method of treatment. One attack confers immunity from another often for life, always for a long period. The disease is transmissible by inheritance, as in the case of the other exanthemata when the child is born before the mother recovers from disease. Finally the sequelæ do not constitute transmissible disease, even by inheritance. As in the other zymotic diseases, a portion of the virus, however small, is capable of infecting the whole body, as if by fermentation. Thus the analogy of syphilis with the contagious exanthemata is clear, only its febrile symptoms are less marked, its efflorescences more varied, and its course much more protracted—counted by months instead of days—and more subject to variation, as well as more amenable to treatment. Syphilis is fortunately only contagious, it is not infectious; its poison is not volatile, is not diffused in the air; direct contact of the virus with a surface capable of absorption is essential to the production of the disease.

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[1] "Histoire naturelle de la Syphilis."

[2] Although this antagonism may exist, still cases of undoubted cancer have been encountered by the authors upon patients, who, at an earlier period of life, were certainly affected with syphilis.

[3] Reynolds's "System of Medicine."

The arguments and theories concerning the unity or duality of the syphilitic virus are out of place in a text-book. What syphilis is will be shown in the following pages—what it is not has been already set forth. In the early part of this century measles was not distinguished from scarlet fever, and the best pathologists set down chancroid, gonorrhœa, and vegetations, all as syphilitic. But truth has appeared, though slowly, and at the present day the great majority of the most reliable authorities on syphilis are in accord. Old writers are dangerous guides, for they had no aid from the light of experimentation furnished to the present generation by Ricord, Bassereau, Clerc, and a host of others. Few at the present day can be found who could fall into the error of Hunter, and consider as gonorrhœa a urethral discharge producing syphilitic chancre by hetero-inoculation, since urethral chancre is so well known; but many still look upon vegetations as indicating syphilis, and there are some distinguished names still laboring to preserve the identity of chancroid with syphilis—and that, mainly, because exceptional examples or obscure cases, not thoroughly well marked, seem sometimes to give the symptoms of syphilis after an apparent chancroid, and no syphilis after a seeming chancre. Rollet[1] has ably dealt with these cases, about which something will be said farther on; suffice it now to remark that the fight is based upon exceptions. In the vast majority of reasonably well-marked cases, syphilis is as different from chancroid as night from day. A patient may have malignant scarlet fever and die in a day without a sign of eruption, but still he has scarlet fever, as no one denies. Even if one syphilitic chancre out of twenty were not indurated, the other nineteen would be amply sufficient to establish a rule. But the proportion is far larger, and there is, perhaps, no symptom of any disease more constant than is the induration of syphilitic chancre, yet the patient does not have syphilis because his chancre indurates—as was formerly taught—on the contrary, he already has syphilis before his chancre appears. If he did not have it, he could have no chancre at all, and the induration of that chancre is just as much one of its symptoms as is ulceration, of a chancroid. If a patient is exposed to measles, and dies during the period of incubation, before he is at all sick, he cannot be said not to have the measles; the same of a patient who has absorbed syphilitic virus: he has syphilis at once, and because he has syphilis he gets a sore at the point of entrance of the poison, after a period of incubation, as the first symptom of the disease. This chancre may be destroyed by caustic, but the disease will run its course unaltered.

INTERVAL BEFORE ABSORPTION.—Clerc[2] tells of a medical student who washed himself immediately after sexual intercourse, and on careful examination for several days subsequently detected absolutely nothing; twenty-eight days afterward chancre appeared, followed by general syphilis.

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[1] "Traité des Maladies vénériennes," Paris, 1866.

[2] "Traité pratique des Maladies vénériennes," Paris, 1866.

Hill[1] relates a very important case, bearing upon this point. A man in sexual intercourse tore his frænum at 4 A. M. The wound bled freely. Fearing possible infection, he called upon Hill during the same day, within twelve hours after the accident. To quiet his fears, although there was no lesion evident except the abrasion, Hill cauterized the surface freely at once, with fuming nitric acid. The slough separated in due time, leaving a healthy surface, which cicatrized promptly. About one month afterward, the scar indurated. It never ulcerated again, but the regular manifestations of true syphilis came on at the usual interval.

What more striking evidence could there be of the inability of any local cauterization to interfere with the regular development of this blood-disease, after it has once been acquired?

Diday[2] cauterized a syphilitic chancre within six hours after its appearance; but, although the sore healed promptly, general syphilis followed.

No attempts have been made experimentally to destroy the point where true syphilis has been inoculated upon healthy subjects, but the experience furnished by the known action of other poisons may be used to form a conclusion by analogy. The rapidity of absorption of the poison of a snake-bite is well known, as is also that of rabies and the poison of a dissecting wound, and there is no reason why that of syphilis should be less so. The French veterinary surgeons have inoculated horses with the poison of glanders, cutting out the seat of inoculation one minute after insertion, but the disease followed just as surely as if nothing had been done. Similar experiments have been performed on sheep, with the same result. Clerc[3] vaccinated some children, destroying the inoculated point one hour afterward with nitrate of silver; vaccinia followed, and a second vaccination failed to take. Seven children were vaccinated by Aimé Martin,[4] and the spot destroyed with Vienna paste, at intervals varying from one to twenty-four hours, after insertion of the virus. None of the children had vaccinia, but that the vaccination was protective is proved by the fact that in only one out of the seven cases could vaccinia be produced by subsequent insertion of vaccine lymph under the skin.

This analogy seems perfect. The spot, even during the period of incubation, may be destroyed so thoroughly that no evidence of the entrance of the poison will be manifested by a subsequent characteristic sore; yet, that the protective power of the poison (vaccine virus) operates as well as if the characteristic sore had appeared, is shown by the failure of subsequent attempts at vaccination.

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[1] "On Venereal Diseases," London, 1868.

[2] "Annuaire de la Syphilis," 1858.

[3] Quoted by Hill.

[4] "Thèse de Paris," 1868.

How different with chancroid! Here there is no period of incubation as there is with vaccine and syphilitic poison. When the virus touches a denuded portion of tissue, changes commence at once. If our eyes were microscopic, we could probably appreciate those changes; as it is, we have to wait some hours before the first signs appear. Chancroid can be aborted by applying certain fluids to the inoculated spot within a few hours, and destroyed totally by caustic after it has appeared.

Syphilitic chancre is the first symptom which indicates that syphilis has taken possession of the patient. It is an abrasion or an ulcer something like chancroid; but, unlike the latter, it and the syphilitic manifestations following it only appear once in a lifetime. This rule, like all others, has its exceptions.

SECOND ATTACK OF TRUE SYPHILIS.—Hutchinson[1] saw a well-marked case, in a physician, of two attacks of syphilis, each preceded by its characteristic syphilitic chancre. The same patient had had small-pox twice. Many other cases are found scattered through the literature of syphilis, and they go to prove that syphilis gets well, for, until one attack is recovered from, another cannot be acquired. Diday[2] has collected twenty-five cases, of which he personally saw twenty. All had had syphilitic symptoms, which had disappeared, except in a few, where some late (tertiary) symptoms remained. In all of these cases there was syphilitic chancre with characteristic induration, occurring a second time after a previous syphilis. In fourteen, the inguinal glands were not indurated, and there was no further sign of syphilis. In nine, general syphilitic symptoms appeared, but they were less intense than during the first attack. In two, the second attack was more severe than the first.

In analyzing these cases, Diday found that in none did the second chancre appear until all signs of previous syphilis had passed away, or, in some cases, where tertiary (non-transmissible sequelæ) symptoms alone remained. The nearer the second attack came to the first, the more feeble was the effect of (second) infection, yielding only chancre; the greater the interval, the more marked the effect. The two severe cases followed their predecessors after more than nineteen years. The lighter attacks followed severe ones, and *vice versa.* Diday concludes that the minimum time for the cure of syphilis is twenty-two months, and that, where syphilitic chancre appears twice in the lifetime of an individual, the second attack should not be treated until symptoms of secondary syphilis appear, as these may never come on, the whole attack consisting simply in syphilitic chancre.

Heinrich Koebner[3] has recently again collated the evidence on this subject. He has collected into a table over forty cases of supposed reinfection; but that these cases of syphlilis, reöccurring in an individual, are still very exceptional, and not as common even as we might be led to suppose from finding mention of nearly half a hundred in the same essay, is shown by a careful perusal of the article in question. Several of the cases detailed by Koebner were certainly tertiary ulcerations of the penis, mistaken for syphilitic chancre, as indeed Sigmund has already pointed out in regard to some of these very cases,[1] and Case VIII., on which Koebner lays most stress, is, of all, most clearly one of tertiary ulceration. The facts of this case are briefly these: A man of forty-five has syphilis in 1866, and his wife an ulcerated tubercular syphilide in 1867. In 1871 the man applied for treatment of a very hard, flat ulcer, quite large, and with sharp-cut edges, saying that it had ulcerated within the previous twenty-four hours. Inguinal glands intact. His last periods of sexual intercourse were ten weeks previously with a prostitute; nine and nineteen days before date, with his wife. The wife was examined, found healthy, and remained so; the patient still bore evidences of tertiary syphilis upon his person. His ulcer on the penis got well under iodide of potassium, and he had no eruption or other evidence of syphilis after it. Such a case requires no comment.

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[1] *Loc. cit.*

[2] "De la Réinfection syphilitique, de ses Degrés et de ses Modes divers," *Archives Générales de Médecine,*" July and August, 1863.

[3] "Berliner klinische Wochenschrift," 46, p. 549, 72. "Ueber Reinfection mit constitutioneller Syphilis."

While, then, a second true syphilitic infection is possible even while the subject bears the marks of late tertiary disease, yet such infection is eminently exceptional, and allowance must be made in the reported cases for (1) chancroid accompanied by some eruption, as a coincidence; (2) ecthyma mistaken for syphilis, after which the first true syphilitic infection might pass for a second; (3) false chancre, indurated mucous patch; and (4) cases of tertiary ulcer faultily diagnosticated.

TRANSMISSIBILITY TO ANIMALS.—Besides this peculiarity of only appearing once in a given individual, syphilis differs from chancroid in not being transmissible to animals. Lancereaux,[2] quoting Ruiz Diaz de Isla, mentions fancifully that even plants have been accused of having syphilis transmitted to them by sprinkling them with water which had been used to wash syphilitic ulcers. Horses and asses suffer sometimes from a disease, the "doury," perhaps remotely analogous to syphilis, which is transmitted only by sexual intercourse. It comes on, after an incubation of four to six weeks, with fever and cutaneous tumors (not the subcutaneous tumors of farcy). The mucous membranes, glands, eyes, and bones, take part in the disease. Atrophies and paralyses follow. It lasts from two months to three years, and is not transmissible by inoculation. These animals also have a local contagious, venereal affection (Lancereaux). Cows are said to have somewhat similar affections, but it has been found impossible or very difficult to propagate any of these maladies by inoculation, and their comparison with syphilis is at best fanciful.

[1] Pitha und Billroth, Handbuch.

[2] "La Syphilis."

Depaul speaks of a syphilitic monkey, and Vernois[1] of a cat with syphilitic cachexia; but these badly-defined examples cannot stand against the innumerable efforts which have been made, without success, to transmit syphilis in any form to any animal by inoculation. All such efforts have failed absolutely, and authority speaks plainly on this point, that the sad privilege of having true syphilis belongs alone to mankind.

Incubation of Syphilis.—After the poison of syphilis has been absorbed, the break in the epithelium, through which it entered, heals, and the virus ferments, as it were, in the blood, until it is ready to give itself local expression, first at the point of entrance, in the form of syphilitic chancre. Such an abraded point may be kept open by dirt or local irritation, but usually nothing at first evinces to the patient that he is infected. This period of incubation, or hatching, has been critically studied by many authors, both by inoculation upon healthy subjects, and, clinically, by close observation of patients. The results arrived at are in the main identical. The usual period after contact, or inoculation, at which a chancre first appears, is about the end of the third week. It is not unusually at four, and may, in exceptional cases, be much later, reaching ten weeks. Fournier[2] gives one case of seventy-five days, quoting A. Guérin for another of seventy-one. During all this interval of incubation, the patient bears no sign of disease. The shortest limit of incubation, clinically, has not been absolutely decided upon, but rarely, if ever, does true syphilitic chancre appear before the tenth day; chancroid, as already shown, rarely appears as late as the tenth day.

This is, perhaps, the most valuable mark of a syphilitic chancre, and practically all sores appearing later than ten days after suspicious contact must be regarded with distrust, while those coming sooner may be more lightly considered.

In establishing a period of incubation for syphilitic chancre, Rollet gives a table of twenty-six collated cases, where inoculation was practised upon healthy subjects. The inoculating fluid was derived in eleven cases from syphilitic chancre, in the rest from mucous patches, syphilitic pustules, ulcer of tonsils, blood, pustules of inherited syphilis. In all a positive result is reported. The shortest period of incubation before the appearance of chancre was ten days (from ulcer of tonsils), the longest thirty-nine days (from chancre), the mean twenty-five days. The mean from inoculation of chancre was twenty-four days; blood, thirty; mucous patch, twenty-two; pustule, thirty.

Induration of Syphilitic Chancre.—The period of incubation of a chancre cannot, clinically, be always obtained with accuracy. Induration can always be felt, when present, and in well-marked cases it is absolutely pathognomonic. It consists in an infiltration of the tissues underlying the chancre with small round or oval and spindle cells, some granular matter, and free nuclei. It may only partially underlie the ulceration in exceptional cases. It exists in three varieties:

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[1] *Bul. de l'Acad.*, 1864.

[2] "Sur la Syphilis," Paris, 1873.

1. A thin superficial layer of induration, aptly called "parchment-like," exactly underlying the ulceration. This may escape notice, unless the sore be pinched up carefully with the thumb and finger, placed on either side, and lightly pressed upon, so as not to be bent or folded by the pressure. This is the commonest form.

2. The induration may resemble a split pea, situated exactly beneath the ulcer, which is upon its flat surface. This induration is easily felt and is unmistakable when present. It is little or not at all sensitive, freely movable over the parts beneath, hard, like bone or wood, or like cartilage, having indeed a certain springy, elastic feel. It is sharply defined, clean cut as it were, ends abruptly, and does not shade off into the surrounding tissues, like inflammatory induration.

3. The induration may be very extensive, far surpassing the bounds of the ulceration placed upon it, excavated or convex upon its surface, but here all the characters and qualities of the induration are the same as those detailed above for the split-pea variety, only there is more of it. The skin over it is not usually red, and the feel is far different from the boggy, inelastic sensation given to the fingers by pressure on an inflammatory induration.

Induration is greater or less, according to the tissue in which it is formed. It is usually greatest in chancres of the skin, lips, nipples, behind the corona glandis, and near the frænum of the penis. In spongy tissues like the glans penis, the induration is often very slight. In certain very rare cases, it appears to be altogether absent, probably sometimes because it had not yet appeared at the moment of examination, or had passed away, and undoubtedly sometimes because the true syphilitic lesion was not detected, but some chancroid, existing simultaneously, was discovered, found soft, and believed to be the origin of the syphilis that followed. Again, when a syphilitic chancre becomes phagedenic, it loses its induration at once.

The induration of a syphilitic chancre may precede the ulceration, or may follow it. In the latter case it comes on during the first week. The parchment-like variety disappears the soonest. It has been observed to last only twelve days (Clerc). Usually, however, any form of induration will outlast the ulceration — remaining, indeed, for two or three months. More rarely it lasts for years, as a cicatricial hardness similar in feel to the true syphilitic induration. Ricord records one case of thirty years' standing. Fading induration may suddenly reappear, and increase on the outcropping of general symptoms. Fournier[1] first described certain indurations which occasionally appear in the neighborhood of a syphilitic chancre, though not immediately connected with it.

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[1] "Étude clinique sur l'Induration syphilitique primitive," *Arch. Gén.*, 1858.

They are formed in and around the lymphatic vessels, and may very rarely also ulcerate.

Ulceration of Syphilitic Chancre.—Properly, syphilitic chancre does not ulcerate. It consists, in more than half the cases, simply of an excoriated surface, looking red and bloody, perhaps pultaceous, very superficial, not infrequently scabbed when exposed to the air. Indeed, it may never even excoriate, although this is exceedingly rare, the lesion consisting in a simple indurated tubercle which scales off a little at the top, but from which the epithelium is never absent, in other words, which is never even moist. Chancre, however, especially of the genitals, rarely escapes more or less inflammation, hence it is the rule to find some shallow, occasionally deep, ulceration. When shallow, the ulcer is round or oval, with slanting borders, often a red base, sometimes partly covered with a pultaceous deposit. When deep, the borders are never abrupt, as in chancroid, but always sloped off. The cavity is funnel-shaped. The borders of the ulcer are adherent all around, never by any chance undermined, as they occasionally are in chancroid. Sometimes the induration, left behind on the healing of a chancre, reulcerates.

Character of the Discharge.—Pus does not form as such on true syphilitic chancre, unless it be inflamed, when the thickness of the pus will vary with the degree of the inflammation. Ordinarily the discharge is sero-purulent, or purely serous in appearance, often bloody, and sometimes, on the dry, indurated papule, there is absolutely no discharge at all.

Pain.—In unirritated syphilitic chancre as a rule there is absolutely no pain. A patient often carries a chancre for a considerable time without suspecting its existence, and sometimes, undoubtedly, it comes and goes without being discovered at all. In this way may be explained many singular cases of undoubted syphilis, apparently not preceded by any primary lesion.

Case XLV.—A young girl of sixteen entered the hospital covered with a roseola, with sore-throat, etc., evidently syphilitic. She denied any sexual intercourse. On examination she was found to be a virgin; no ulceration could be discovered about the genitals, the mouth or throat, or upon any part of the body. The only evidence of any previous lesion upon her skin was a small cicatrix of purplish color, slightly hard, upon the radial aspect of the right arm. When the girl's attention was called to it she expressed entire ignorance of the presence of any ulceration or other lesion upon the part; in fact, seemed to see the little discolored cicatrix for the first time. Upon close investigation it was found that the girl was a nurse, that she took care of a young baby, and carried it frequently, often without a napkin, upon her bare right arm. Examination of the child proved that its anus was surrounded by mucous patches. Here was a case of chancre of the arm innocently produced, utterly ignored by the patient, and so small as to have easily passed unnoticed.

Many other equally curious and instructive cases have been recorded. If this girl had been a prostitute, and had happened at about the same time to have chancroid, acquired in sexual intercourse, how naturally would the most conscientious surgeon have deceived himself in attributing the syphilis to the chancroid! An inflamed chancre does pain more or less, but usually far less than chancroid.

Cicatrix.—The scar left by chancre varies. In the majority of cases where there is only a slight excoriation or exulceration, no scar whatever is left behind. In other cases the scar is proportionate to the depth of the ulcer. These scars are occasionally pigmented. At first they are discolored—of a dark, vinous hue, like the ordinary syphilitic tubercle, of a color aptly compared by Fallopius to the flesh of raw ham. This color may be followed by the true copper-colored (Swediaur) or bronzed pigmentation. The latter sometimes approaches a black. It clears off gradually from the centre, to leave the scar finally whiter than the surrounding skin.

Inoculation.—Hetero-inoculation of syphilitic virus upon healthy individuals was first performed by Wallace in 1835, with virus derived from mucous patches. It has since been very thoroughly studied by the few experimenters who have practised it, aided by the light of chancroid inoculation. Clinically vaccinal syphilis has furnished ample opportunities to study the effects of hetero-inoculation—accidental it is true.

Auto-inoculations have been performed without number, the result (with some little exception to be mentioned below) having been invariably negative, unless the chancre had been previously irritated by friction, savin-powder, tartar-emetic, or other irritant, or was itself in a state of inflammation, producing pus. Under such circumstances auto-inoculation will often produce a pustule, followed by a small ulcer, remaining open, perhaps, for some time, furnishing pus, also auto-inoculable, but this ulcer has not the rapid march nor the characteristic appearance of chancroid, and has never been proved to be such, by being inoculated upon a healthy individual and there producing a characteristic chancroid not followed by syphilis. This may be and has been done by inoculation from a mixed chancre, but never from pure syphilitic chancre. The pustule and ulceration produced by auto-inoculation of chancre is similar to what may also be produced by inoculation of pus of other syphilitic lesions, or sometimes with that of gonorrhœa or abscess; in other words, it is the pustule and ulceration of simple inflammatory irritation, not the special poisonous sore known as chancroid, which is so freely inoculable, and as simple dirt and irritation may call out a mucous patch or pustule upon a syphilitic subject, so may also auto-inoculation of some of the syphilitic products.

The difference between the inoculation of chancroid and syphilitic chancre has been strikingly illustrated not a few times. The three famous cases of Lindmann, Warnery, and Danielssen, are perhaps the most conclusive. Lindmann inoculated himself a number of times with chancroidal pus, always with success, but with no syphilis; finally, as the doctrines of syphilization were in vogue, believing himself protected, after having produced a dozen chancroids, he inoculated himself with matter taken from the ulcerated tonsils of a syphilitic friend. This was followed on the eleventh day by a papule (not a pustule, as after the previous inoculations). The papule ulcerated slightly, and in forty-five days a general syphilitic eruption appeared. The doctor now recommenced his inoculations with chancroid matter, and when last heard from was still continuing, then having reached the twenty-seven-hundredth successful chancroid ulcer. Warnery, of Lausanne, under the same "syphilization" delusion, inoculated himself plentifully with chancroids, which took, but produced only local ulcers. Finally, he employed the syphilitic virus once, and an indurated chancre appeared after twenty-three days' incubation, followed by syphilis in due course. Danielssen, a disciple of syphilization, inoculated a man, who had elephantiasis, two hundred and eighty-seven times with chancroid, until he had temporarily exhausted the irritability of the skin, and no more chancroids could be produced by inoculation. In other words, the patient was "syphilized," as it is called. Now, one inoculation was made with true syphilitic virus. An indurated, syphilitic chancre appeared, and in sixty-eight days a general syphilitic eruption followed. Since then very little has been said by its advocates of "syphilization" as a prophylactic.

The course of syphilitic chancre observed by *hetero-inoculation* is briefly as follows: A chancre is always produced with or without ulceration, a mucous patch never, although certain published observations state the contrary. A strict analysis of these cases proves that they commenced as indurated chancre, and became mucous patches only secondarily after an interval. The first result of hetero-inoculation has often been a pustule, just such a little fester as might appear after the prick of a pin, but this pustule heals entirely in a few days. It is accidental, and in most instances nothing remains to mark the inoculated point except the dried speck of blood. This finally rubs off, and the skin becomes absolutely normal. No change occurs for a period varying from ten to thirty-nine days in the reported cases. Then the first signs of chancre appear, not as in chancroid by a pustule, but as an indurated papule (which, becoming larger, may be called a tubercle), of a dark, vinous-red color, without pain, or perhaps with a little itching. This may remain dry, being covered after a while by a scaly crust, or may, and usually does, ulcerate after a few days, often scabbing secondarily. The epidermis may raise as a pustule before ulceration. The ulcer has sometimes been noted as appearing from the first, but usually at a mean of five days after the papule. It persists for a variable period, several weeks, possibly months, and, getting well, leaves often a pigmented cicatrix behind. The neighboring lymphatic glands indurate, do not suppurate, and general syphilis follows.

This is the course with no appreciable variation, no matter what fluid is inoculated—chancre secretion, pus from mucous patch, blood, or other discharge.

An apparent exception to the above course exists for vaccinal chancre, where chancre-virus or syphilitic blood is introduced along with vaccine virus. Here the vaccine virus, having a shorter incubation than the syphilitic, develops sooner, and the vesicle runs along regularly, perhaps, at first, but varies from the true type after a time, in that the base indurates and the surface ulcerates; or, perhaps it may scab, the whole resembling a large, scabbed, ecthymatous pustule. Sometimes only the syphilitic virus takes, when, after a longer incubation, the regular papulo-tubercle of syphilitic incubation appears and runs its usual chronic course; or the vaccine vesicle may be imperfect and abortive, the sore soon putting on the appearance of a cutaneous chancre, and general syphilis following in due course.

There is one source of error in regard to vaccinal syphilis; namely, that the vaccinal fever may develop latent, possibly unsuspected, syphilis from which a child is already suffering by inheritance, or previous contagion. Here the vaccination will always be accused of being the cause of the syphilis. The distinction is easy. If vaccination develops latent syphilis, it does so as does the application of a blister or other irritant, and a more or less general eruption comes on quickly, usually starting from the point of irritation, vaccinal or other; whereas, in true vaccinal syphilis, there is first a period of incubation, then a local chancre, then indurated glands, and after a second incubation a general (at once) syphilitic eruption, which does not tend to start from the irritated point. Chancres of inoculation are of course liable to the same complications as chancre naturally acquired.

When the inoculating fluid is rubbed upon a scarified, or a blistered surface, the lesion appears multiple at first, many little papules springing up in the patch, as if many separate points had been simultaneously inoculated, which is indeed the case; these, however, soon coalesce into one mass, forming one lumpy, tubercular chancre-patch. This explains at once how syphilitic chancre may be multiple, several different points having been inoculated at the same or nearly the same time.

MULTIPLE INOCULATION.—In testing this point it has been found that, where many points were inoculated at the same time, usually all took and appeared simultaneously as chancres. Where the intervals of inoculation were a few days apart, upon the same individual, nearly all took. Puche inoculated twice at twenty-two days' interval; chancre appeared upon both points at the same time. In other cases the second inoculations have appeared to require a longer incubation than the first. Again, inoculations made upon different individuals, with virus derived from the same lesion, have required different periods of incubation for their development.

These apparent exceptions to the fact first noted by Hunter, that syphilis was not reinoculable upon an already-infected person, are still further borne out by the results of other experiments, such as those of Wallace, who produced an indurated chancre by using chancre-virus upon a man who had reached the eruptive stage of the disease. Wallace, Bidenkap, Sperino, Lee, and others, have performed auto-inoculation soon after the appearance of chancre, in some cases with success, producing a small, ill-defined, indurated chancre, usually with short incubation. Fournier and Puche believe that about two per cent. of auto-inoculations of syphilitic chancre take, presumably when some irritation (inflammatory) of the chancre exists, but the vast majority, especially where the chancre is fully developed, yield only negative results, and in no case does the auto-inoculation of syphilitic chancre produce the pustule and rapidly-advancing characteristic ulcer known as chancroid.

The rule, then, is practically this: reinoculations of syphilitic virus upon patients already syphilitic produce no result. Auto- or hetero-inoculation upon a patient with very young chancre is occasionally successful. A more constantly favorable result might be expected from hetero-inoculation during the late tertiary stage of the disease. At both of these periods the patient is not fully protected, the system not being saturated with the syphilitic poison at first, and the virus being at a minimum toward the end. Between these periods very rarely will reinoculation of any syphilitic virus produce any effect, although an irritative ulceration may be produced in some subjects by the inoculation of any inflammatory pus, and chancroid is inoculable at will in its full vigor on all subjects.

This subject finds an apt and analogous illustration in the results of inoculation with vaccine virus. Any number of such inoculations made at the same time may take fully. Reinoculations practised before the first inoculation has taken or while the vesicle is young, will also yield positive results, but to a less degree. Then, while the protecting power of the virus lasts, the result is invariably negative, or only abortive pustules are produced (false takes). Finally, after a variable period the protection becomes weak or exhausted, and inoculation produces a partial or even perfect result.

Secretions capable of transmitting Syphilis by Inoculation.—This subject has been carefully studied by inoculations, as well as clinically by confrontations, that is, by examination of the individual from whom a given patient acquired his syphilis, and comparing the lesions. The first confrontations of syphilitic chancre were made in 1852, by Bassereau.[1] Later, the confrontations of Diday, Rodet, Fournier, Clerc, Musset, Rollet, were published by Dron.[2] Fournier[3] followed, and numerous other contributions, since made, furnish in all a very full collection from which to draw deductions. The results arrived at have been identical.

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[1] "Des Maladies de la Peau symptomatiques de la Syphilis," Paris.

[2] "Thèse de Paris," 1856.

[3] Ricord's "Leçons sur le Chancre," 1858.

Inoculations of healthy subjects with the fluid secreted by syphilitic chancre, mucous patches, any secondary cutaneous, or mucous lesion, yielding a discharge, and of syphilitic blood (Pellizari, Waller, Lindwürm) drawn from a patient with an eruption, taken either from a papule or tubercle, or from the healthy skin between the lesions—all such inoculations yield indurated chancre after a period of incubation, which chancre is succeeded by general syphilis. Whether the blood of syphilis is poisonous in the intermediary periods between the eruptions, when the skin and mucous membranes are sound, is not yet established, but certain observations of vaccinal syphilis would go to prove that it is.

The secretions of other pathological lesions, not syphilitic, will not produce syphilis unless some of the patient's blood be inoculated at the same time. Gonorrhœa, acquired from a syphilitic patient having at the time only gonorrhæa, reproduces itself as gonorrhœa, and not as syphilis. The same is true of chancroid, even by inoculation, if no syphilitic blood be inoculated along with the pus. Certain confrontations and inoculations of mixed chancre go to prove that from such a sore may be derived either simple chancroid or mixed poisonous chancre. Diday inoculated pus from a pustule of acne produced upon a patient "in full syphilis," by the administration of iodide of potassium. The result was negative. The same is true of the vaccine virus. Pure vaccine virus, taken from a syphilitic patient before there is any pus in the vesicle, will produce vaccinia only, if no blood is inoculated. This is well shown in some of the vaccino-syphilitic epidemics, where many children were vaccinated at the same sitting, from the same child, the virus being taken from arm to arm. Often, in such cases, the result has been that those first vaccinated developed vaccinia only and no syphilis; others a little later, when the virus was giving out, developed vaccinia, followed by indurated chancre on the same spot, usually before the vaccine pustule got well; finally, those last vaccinated developed only an abortive vaccine vesicle or none at all, while indurated chancre appeared after incubation upon the vaccinated spot, and general syphilis followed. All the controversy on vaccinal syphilis cannot be reproduced here. Suffice it to say, syphilis can be communicated by vaccination, but only where blood has become mingled with the vaccine lymph, or where a true chancre lies hidden under the vaccine vesicle and mingles its discharge with the vaccine lymph. If pure lymph be taken early, neither does chancre follow at the vaccinated point, nor syphilis afterward; but, since a little blood may readily be mixed with the lymph, and not be perceived, no amount of caution is too great, and in no case should vaccine lymph, derived from an individual even remotely suspected of being syphilitic, be employed. If not the lymph, much less should the vaccine scab be used, as it necessarily contains, besides vaccine lymph, both pus and blood, and a portion of the solid tissue of the skin of the individual from whom it was taken.

Inoculation has failed to produce positive results from ulcers of the late tertiary period of syphilis. Diday[1] inoculated sixteen times with blood from patients suffering from tertiary syphilis (nodes), always with negative results. The fact that patients with tertiary syphilis may occasionally acquire a chancre and the earlier eruptions anew, and the other undoubted fact that such patients may procreate healthy offspring, render it still more certain that late tertiary syphilis is no longer either communicable or transmissible. Bumstead[2] mentions one case of probable transmission of syphilis by inoculation from blood in the tertiary stage. The victim was a surgeon of Ohio, who reports that he inoculated an abrasion on his finger while operating upon a case of syphilitic necrosis of the skull. Chancre and general syphilis followed in due course. As for transmission, on the other hand, patients who have positive tertiary symptoms undoubtedly procreate diseased children sometimes, just as they as certainly often produce healthy ones. Hence, tertiary syphilis may be said to be generally, but not always, free from the dangers of transmission and of communicability. The older the disease, the less apt it is to be transmitted. The male loses the power of transmission seemingly before the female.

None of the physiological secretions or excretions can produce syphilis by inoculation. Mucus from the mouth or vagina may be inoculable, if any syphilitic lesion (chancre, mucous patch) exist upon the membrane from which the fluid is collected, otherwise the result is invariably negative. The same has been proved by experiment to be the case with tears, sweat, urine, semen, milk. Milk from a syphilitic woman is neither inoculable experimentally, nor does it give the disease to the child who drinks it. Apparent infections by milk, without any recorded primary lesion (Melchior Robert, Lane, Parker, Mahon, Bell, and others), are set off by other carefully-observed cases, where children suckled by a syphilitic nurse have escaped disease, even where the nurse had a specific lesion of the nipple (Dugès, Ricord, Cullevier, Nonat, Vernot, and others). Where the nurse has a syphilitic lesion of the nipple, the child surely becomes poisoned, if it have a fissure or other abrasion of the lips through which the poison can be absorbed; but in such case syphilis in the child is always preceded by chancre of the lips or mouth.

Semen, although not inoculable, is believed sometimes to contain the germ of the poison, infect the ovule, through it the child, and through the child the mother.

METHODS OF TRANSMISSION OF SYPHILIS.—Syphilis always commences as a chancre, with two exceptions:

1. Inherited syphilis. If the father be syphilitic and the mother healthy, the child seems sometimes to escape infection, probably because at the moment of impregnation the virus in the father, either from the effect of treatment or from a natural lull in the disease, was not in a

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[1] *Gazette Médicale*, 1849.

[2] Referring to *Medical Times and Gazette*, August, 1861.

state of activity,[1] or because he had advanced too far into the tertiary stage to be able to transmit it.[2] Fathers with tertiary syphilis certainly, as a rule, where the mother is sound, procreate healthy children, as far as syphilis is concerned. Where the mother and father are both diseased in the earlier stages, the child is invariably syphilitic. Where the mother alone has syphilis (except in the later tertiary form), the child is also always infected, unless the mother is under treatment.[3] Ricord and Baerensprung believe that the child is rarely if ever infected, if the mother acquire her disease after the seventh month of pregnancy.[4]

2. Where a mother becomes poisoned by carrying a syphilitic child in her uterus, the germ of the poison having been communicated to the child through the spermatozoon of the father, the mother having no chancre. That this method of infection occurs is doubted by some high authorities.[5]

Chancre is produced wherever upon the human body the syphilitic virus contained in the secretion of chancre, in blood, or any secondary syphilitic lesion, is brought within reach of the absorbents, by being placed upon a surface deprived of epithelium. That it may make for itself a way through the tender epithelium of mucous membrane, if left long enough in contact with it, as does the poison of chancroid, has not been proved, but, from certain cases, seems highly probable. It cannot get in through the epithelium of the skin without an abrasion of the latter.

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[1] Hippolyte Mireur has collated the evidence on the subject under discussion in an admirable essay, "Sur l'Hérédité de la Syphilis," Paris, 1867. He leans toward the belief that, if the mother escape, a syphilitic father cannot produce a syphilitic child. He gives the following case (page 26): About a year after contracting chancre, followed by well-marked secondary symptoms, which had disappeared entirely under treatment, M. C—— married. Ten months afterward his wife was delivered of a vigorous, healthy child, "the image of his father," who remained perfectly well up to the age of two years. At this date a little indolent erosion appeared upon the lip of the father. The latter paid no attention to it, but continued to fondle and kiss his child. After a time there appeared upon the lip of the child a livid, indurated excoriation, one centimetre in diameter, accompanied by indolent bubo under the jaw. After a time, in spite of treatment, the child developed a characteristic syphilitic roseola and mucous patches at the anus.

[2] Mireur (page 91) relates the case of a syphilitic mother and father, where the disease ran its course without specific treatment. After two miscarriages and a still-birth at term, the fourth and fifth children were born alive, but developed syphilitic eruptions shortly and died. The sixth and seventh children were born healthy and continued well, notwithstanding the fact that both father and mother had subsequently "gummy tubercles and ulcers scattered abundantly over the extremities," for which they finally placed themselves under specific treatment.

[3] In Thurman's case (*Journ. de Méd. et de Chir.*, Toulouse, October, 1851), two syphilitics were married. Both had been treated, apparently recovered, and never afterward, while under observation, manifested any symptoms of syphilis. Seven children were born, became covered with a syphilitic eruption, and died. Pregnant for the eighth time, the mother was brought under the influence of mercury. The child was born healthy, and grew up sound. Pregnant for the ninth time, the treatment of the mother was repeated, a healthy child resulted, who remained well. Pregnant for the tenth time, treatment was neglected. A child was born, seemingly well at first, who developed a syphilitic eruption, and died after six months. In her eleventh pregnancy the mother again took mercury. A healthy child was born, who remained well.

[4] In Chabalier's case (*Journ. de Méd. de Lyon*, May, 1864), Madame X——, at the end of the seventh month of pregnancy, had intercourse with her husband, who had been traveling for five months. Thirty-eight days afterward (during the ninth month of pregnancy) Chabalier found three indurated chancres on the vulva. The child was born at term, seemingly healthy, and was immediately given to a healthy wet-nurse. One month after confinement the mother left her child to join her husband on his travels. At the end of six weeks Chabalier was called to see the infant. He found it covered with a papulo-vesicular eruption, with intense coryza, and mucous patches on the scrotum and in the mouth. At the same date the mother, while traveling, developed mucous patches at the vulva and anus. The child died.

[5] Sturgis, of New York, "Hereditary Syphilis" (*New York Medical Journal*, July, 1871), has again collated the evidence, endeavoring to show that syphilis in the child depends solely on syphilis in the mother, syphilis in the father being a matter of no importance, so long as the mother does not become directly diseased by him.

The methods of contagion are immediate and mediate. The latter method is much more common for syphilis than for chancroid, owing to the numerous lesions of all parts of the body capable of secreting the poison, their long duration, and apparent insignificance. Hence syphilis is very often transmitted by means other than sexual contact. Surgeons and accoucheurs get chancre of the fingers by inoculating abraded spots in the exercise of their professional duties. Chancre is not infrequently transmitted in kissing, a little mucous patch in the mouth of one party poisoning any fissure on the lips of the other with which it may come into contact. Both of these methods are immediate.

CASE XLVI.—A young gentleman brought his sweetheart to be treated for a hard, excoriated, globular lump upon her lip, which failed to get well under the assiduous care of a homœopathic physician during many weeks. The lump was as large as a cherry, and very hard, as were also the sub-maxillary glands of the same side. The surface of the lump was excoriated, bleeding, tending to scab. It got well promptly under the internal administration of mercury. The young gentleman had mucous patches in his mouth. The couple were married, and the young lady subsequently aborted.

Children acquire chancre of the lips from nursing-women with mucous patches of the nipple, and, on the other hand, healthy nurses get chancre of the nipple by suckling children with inherited syphilis, who have mucous patches of the lips. In this way nurses have been accused of giving syphilis to their nurslings, when the truth was, that they (the nurses) received the disease from the children. Colles's law, that a child with mucous patches of the mouth cannot produce ulceration of the nipple, if it sucks its mother, depends simply upon the fact that its mother already has syphilis before the child is born, and consequently cannot get a new chancre of the nipple.

Many interesting examples of mediate contagion have been recorded. Puche speaks of a gentleman with a long prepuce, who, after marriage, encountered an old mistress, with whom he had intercourse. Returning home shortly, without having washed, he repeated sexual intercourse with his wife, depositing the virus from his prepuce in her vagina. He escaped, but, in due course, she developed chancre and general syphilis.

A similar authentic instance is related of a woman who proved unfaithful. Her husband, embracing her shortly afterward, relieved her of the poison left in her vagina by her lover, himself developed chancre, while she escaped.

Smokers of a pipe sometimes get chancre of the lips, the virus being deposited upon the mouth-piece of the pipe by some previous smoker, who had mucous patches of the lip.

Case XLVII.—An old, gray-headed man came into the hospital with an extensive indurated ulcer upon his upper lip. This, it was found, he had acquired by smoking the pipe of a friend, who had mucous patches. General syphilis of a severe type succeeded.

Glass-blowers get syphilis in the same manner, as they work in sets of three at the same tube, passing it from mouth to mouth. Syphilis sometimes runs through a whole family, from the use of the same spoons or cups, passed from one mouth to another. Washer-women become infected in cracks of the fingers through the virus contained upon soiled clothes. Wet cups [1] once started an endemo-epidemic of syphilis. Transplanting teeth has proved another source of mediate contagión, catheterization of the Eustachian tube has done the same, as has also the operation of circumcision, with instruments which were infected with syphilitic virus, and, in the religious rite, possibly though not probably, the act of sucking the wound.[2] Vaccination is a familiar instance of mediate contagion. In all such cases chancre precedes the development of general syphilis.

Duration of Syphilitic Chancre.—The duration of syphilitic chancre is from two weeks to several months. In about fifty per cent. of the cases a general syphilitic eruption appears before the chancre has cicatrized. A chancre once healed occasionally reindurates and reulcerates.

Number.—Syphilitic chancre is most often unique, because commonly only one point is inoculated. It may be multiple to any extent, according to the number of points deprived of epithelium and capable of absorption, which are primarily exposed to infection.[3] When multiple, however, it is usually so from the first and not consecutively, like chancroid, because its secretion is not auto-inoculable.

Size.—Syphilitic chancre may occasionally reach a large size, as large as a quarter or half dollar. This is, however, exceedingly rare; commonly it does not grow to the size of a nickel penny; it is often as small as a split pea and sometimes smaller. In size and general appearance it compares unfavorably with its more formidable-looking rival, chancroid.

Situation.—Syphilitic chancre occurs indifferently on all points of the body. No regions are exempt from it, or even less liable, as is the case with chancroid. Syphilitic chancres of the head, face, and breast, are not very uncommon. They reach their full size and development. Indeed, chancre of the lip is particularly prominent, large, hard (spherical), and chronic in its course. The genitals, of course, furnish the favorite seat, but simply because they are most often exposed. The favorite position on the penis seems to be the mucous layer of the prepuce, often just behind the corona glandis. Urethral chancre is not very uncommon. A well-marked case is reported in the *American Journal of Syphilography and Dermatology*,[1] of a patient who was treated for gonorrhœa, his symptoms being creamy discharge from urethra, with pain on urination. After a while he developed a general syphilitic eruption, and enlarged, indolent, painless ganglia were felt in the groins. An endoscopic tube was now introduced, and detected on the roof of the urethra, one and a quarter inch from the meatus, the chancre, as a slight oval ulceration, not yet healed. There was no lumpiness around the urethra, no painful spot on erection, no blood in the urethral discharge, but undoubtedly the case was one of urethral chancre; for gonorrhœa does not produce ulceration of the urethra. The endoscopic tube introduced long afterward disclosed a faint whitened cicatrix, marking the position of the old ulcer on the roof the canal. These appearances were verified by several gentlemen. Another (unpublished) case has been observed by the authors during the past year. Chancre of the skin around the genitals and anus is not very uncommon.

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[1] Rollet, p. 620.

[2] R. W. Taylor has written an excellent essay on this subject (*N. Y. Med. Jour.*, December, 1873).

[3] During the past year a gentleman under the authors' care acquired syphilis through multiple points of contagion, and had eight simultaneous chancres, all of about four weeks' incubation.

FORM OF SYPHILITIC CHANCRE.—Syphilitic chancre appears after an incubation of not less than ten days, usually not till the end of three weeks, as a reddened spot, which quickly excoriates; or as an elevated solid papule, which excoriates or ulcerates. It may take any one of four forms, in the following order of frequency:

(1.) Erosion;
(2.) Ulceration;
(3.) Deep ulceration, funnel shaped (Hunterian chancre);
(4.) Indurated papule, which remains dry.

(1.) *Erosion.*—This form is believed to include two-thirds of all syphilitic chancres. Bassereau put it at three-quarters. Its favorite seat is mucous membrane. It is very common inside the prepuce. It is oval or a little irregular in shape, with a polished, raw-looking surface of a vinous-red, sometimes very dark from extravasation of blood or from pigmentation, or of a more subdued gray color; occasionally there is a central adherent pultaceous membrane (Clerc), but usually the only discharge is a sanious serum, and that scanty; no pus being visible whatever. This is indeed an erosion, and not an ulcer. The induration of this form is most often parchment-like, as if the erosion reposed upon a thin sheet of parchment slipped beneath it. The induration is sometimes central, occasionally annular. These erosions are flat. Sometimes an erosion may cap an enormous induration as large as a marble, as on the lip, and not be attended by an appreciable discharge of pus. The surface of these elevated, indurated erosions sometimes granulates, becoming papular. Large flat erosions may occupy the skin, but they usually scab.

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[1] 1871, page 37—Keyes.

(2.) *Ulceration.*—Superficial ulceration with slanting edges is found with parchment, but more commonly with the split-pea, induration. The ulcer may be quite superficial if the induration stand out prominently, or the induration itself may be excavated, when the ulcer will be deep. The base is often grayish, discharging a slight amount of sero-purulent fluid.

(3.) *Hunterian Chancre.*—This form is less common than either of the above, but is actually an advanced condition of the last variety. The induration is often extensive, far overreaching the edges of the ulcer, which latter seems to have eaten down into it. The induration is the specific, cartilaginous, elastic, woody induration of syphilis. The ulcer has sloping, adherent edges, never undermined, not the abrupt borders of chancroid, and the funnel-shaped appearance of the ulceration is not found in any other variety of sore. The shape is rounded or oval. The discharge is similar to that of the last-described ulcer.

(4.) *Indurated papule which does not ulcerate* is found sometimes on the skin after inoculation, natural or artificial, and occasionally on the penis, even on the mucous layer of the prepuce in patients whose prepuce is loose, short, and dry. These indurated tubercles would undoubtedly excoriate or ulcerate if kept moist, and in fact the elevated excoriated chancre often remains for weeks as an induration before the surface erosion appears. Indurated papules of the skin, which do not erode or ulcerate, scale off after a time, or become covered with a scaly crust. The color of these papules is a dark vinous-red.

Under any of the above forms may uncomplicated syphilitic chancre appear. The course is about the same in all. They rarely heal within two weeks, and often last for months. There is rarely more than one of them, and, if two or more coexist, they are usually of the same type. The induration, which generally may be found from the first, occasionally does not appear until after some days. It may disappear within a fortnight, but usually outlasts the sore, remaining behind in the cicatrix. Chancre uninflamed and unirritated is painless.

The symptoms of urethral chancre, which cannot be seen, are usually a discharge coming on long after suspicious connection, generally thin, often bloody, a painful spot along the urethra during erection, and a lumpiness felt through the skin; but all these signs are sometimes lacking, except the discharge, and even this may be quite creamy. The endoscopic tube may be used in certain cases, making an absolute diagnosis of ulcer, and the condition of the inguinal glands goes largely to clear up its nature. Urethral chancre is more often situated just within the meatus, and may be seen by separating the lips of the latter.

Course of Chancre.—Syphilitic chancre progresses slowly, reaching its height in a few days or weeks, and then, with or without a stationary period, repair begins by a change in color of the sore, which becomes more rosy, the induration often simultaneously commencing to abate. Thicker pus forms on the ulcer, and it goes on to cicatrization from the edges. The poison of the secretion remains to the end.

COMPLICATIONS.

The complications of syphilitic chancre are: (*a*) vegetations; (*b*) inflammation; (*c*) chancroid (mixed chancre); (*d*) transformation into mucous patch; (*e*) phagedena and gangrene; (*f*) syphilitic bubo, which is indeed not a complication, but a necessary accompaniment of syphilitic chancre; (*g*) lymphitis.

(*a.*) VEGETATIONS.—Warty growths are liable to spring up around syphilitic chancre of the prepuce or anus, as they are with other forms of irritative disease (chancroid, balanitis, gonorrhœa, p. 21). These are rare and purely accidental. Syphilis as a poison has nothing to do with their production.

(*b.*) INFLAMMATION may complicate syphilitic chancre, from position, mechanical or chemical irritation, etc., occasioning pain, and a more purulent discharge, which latter may be auto-inoculable, producing an abortive pustule, or a small, transient ulcer, and liable to lead to the further complication of suppurating bubo.

(*c.*) CHANCROID may complicate syphilitic chancre, the two sores existing together side by side, each with its own peculiar characters, or the same spot may have been simultaneously or successively inoculated by the two poisons, giving rise to what is known as "mixed chancre," a sore which possesses the characters and qualities of both of these lesions. The two poisons are distinct, and run their own course, each unmodified by the other, but, if both develop upon the same spot, the character of the lesion is altered, and it becomes a *mixed sore.* When a syphilitic chancre is inoculated with chancroid pus, the ulceration rapidly deepens and progresses, putting on all the characters of chancroid; but the syphilitic induration remains. On the other hand, when a chancroid is inoculated with syphilitic virus the ulcer is unmodified, but, after a proper incubation, syphilitic induration sets in. These facts, which have been proved experimentally, have been also verified clinically by confrontation. If a given abrasion be inoculated with both poisons in sexual intercourse, the chancroid develops first, and, for a time, nothing but a chancroid exists, furnishing auto-inoculable and hetero-inoculable pus producing chancroid only, and not syphilis. After a certain variable incubation, however, the soft sore indurates spontaneously, and then the chancre is mixed, capable of imparting chancroid alone by contact, since the chancroid poison is more virulent, more contagious, than the syphilitic; or mixed chancre, followed by general syphilis. Finally, if the period of incubation of the syphilitic virus happens to be very long, the chancroid may get well, or be cured by cauterization, but in due time the syphilitic chancre appears upon the same spot, and then hetero-inoculation will produce only the syphilitic chancre, with its inevitable accompaniment, general syphilis. The literature of experimental syphilis furnishes some very striking examples of mixed chancre. The following two are particularly instructive:

Melchior Robert[1] inoculated a student with the secretion of a mixed chancre. A classical chancroid followed, the pus of which proved auto-inoculable. After the ulcer, the result of inoculation with the mixed poison, had nearly healed, induration set in, the sore reulcerated, and general syphilis followed.

Lindwürm[2] had a female patient with multiple chancroid. Upon one of these only he inoculated the secretion of a syphilitic chancre. No change occurred. The patient got nearly well, and left the hospital, but eight days afterward she returned; the ulcer which had been inoculated had broken out afresh, and had indurated. This sore remained open, while all the other chancroids got well and remained well. General syphilis followed.

Mixed chancre, then, is a reality, and does exist clinically. Hence the rule: Wherever the secretion of an ulcer possessed of specific induration, and followed by syphilis, produces by auto-inoculation a characteristic chancroid ulcer, itself auto-inoculable, such indurated ulcer is invariably a mixed chancre.

Mixed chancre is liable to all the complications which may affect either form of ulcer, even virulent bubo.

The methods of acquiring mixed chancre clinically are self-evident. Both poisons may enter simultaneously through the same abrasion. An individual with either variety of sore may inoculate himself, during sexual intercourse, upon the same spot with the other virus.

(*d.*) TRANSFORMATION INTO MUCOUS PATCH.—A chancre, which has lasted until the period for secondary manifestations has come on, may granulate upon its surface, retain or lose its induration, become covered with a whitish pellicle, and, in short, change into a mucous patch. This change has been critically studied by Ricord, Fournier, Deville, Devasse,[3] and others. It is most often observed upon women and children, and particularly upon thin skin and mucous membrane where there is continual moisture, a circumstance greatly favoring the change.

(*e.*) PHAGEDENA AND GANGRENE.—Phagedena, already studied in connection with chancroid (p. 490), may also, though more rarely, complicate true syphilitic chancre. The form most usually seen is the gangrenous. The gangrene may involve all the induration, in which case the latter ceases to be perceptible. The pultacéous and serpiginous varieties of phagedena are very rarely found with pure syphilitic chancre. Their existence, especially the latter, which is most uncommon, makes it probable that the chancre was originally of the mixed variety. Sometimes the ulceration outstrips the induration, in which case the latter disappears; rarely both advance together. In four hundred and fourteen cases of syphilitic chancre, Bassereau found phagedena in sixty. In ninety-eight cases, Fournier found eleven of phagedena. A healing chancre may reulcerate and then become phagedenic. Bassereau, Diday, and others, believe that, when syphilitic chancre is phagedenic, the type of the general syphilis which follows is severe.[1]

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[1] *Op. cit.*

[2] Quoted by Rollet.

[3] *Archives Gén. de Méd.*, 1846.

For diagnosis of syphilitic chancre, *see* DIAGNOSTIC TABLE.

Prognosis.—If the chancre is syphilitic, so also is the patient.

For (*f*) syphilitic bubo, and (*g*) lymphitis, *see* below.

Treatment of Syphilitic Chancre.—No amount of cauterization nor any local treatment can prevent the development of general syphilis after the poison has once been absorbed, much less after the chancre has appeared (p. 509). Cauterization often hastens the healing, but induration is liable to reappear and to reulcerate, and nothing is gained to compensate for the pain of the operation. General syphilis is inevitable.

The best local treatment consists in the use of dry lint, or any mild astringent lotion, or, perhaps better, sprinkling with iodoform, or calomel, or the use of black or yellow wash. The sore is not painful, and will leave less of a scar, if unmolested, than if irritated and inflamed. Mixed sore is better cauterized to destroy the chancroidal virus, and the local treatment of phagedena is the same as already set down for that complication, attacking chancroid (p. 498). There is one important difference, however; namely, that the phagedena attacking syphilitic chancre may be kept up by the general debilitating influence of syphilis upon the patient's vitality, and consequently, in these cases only, the antidote to that influence, mercury, given internally, has exceptionally a favorable effect in retarding the progress of phagedena.

Internal treatment of syphilitic chancre is the same as for early syphilis, and treatment should be commenced in all cases where the diagnosis is undoubted. It has a marked beneficial effect upon the duration of the chancre. Where there is the least shadow of a doubt, no mercury should on any account be administered, until an eruption has cleared up the diagnosis.

(*f*.) SYPHILITIC BUBO.—The term "syphilitic bubo" has been applied to the indolent enlargement and induration of those lymphatic glands receiving the absorbents from a syphilitic chancre, not to the other glandular enlargements occurring in the course of syphilis. Syphilitic bubo consequently may occur in many different situations, according to the position of the chancre. They are usually found in the groin, because syphilitic chancre more often occurs on or around the genitals than elsewhere. Thus the inguinal glands are affected in chancre of the penis, urethra, groin, lower part of abdomen, scrotum, thighs, perinæum, buttocks, anus, or rectum—the submaxillary in chancre of the lips or mouth, the preaural in chancre of the face. In like manner the subhyoid, post-cervical, axillary, epitrochlear, or other gland, may be the seat of syphilitic bubo. With syphilitic chancre of the genitals, the cluster of glands in the groin becomes enlarged and indurated, not a single gland but a group, which group, since Ricord, has become classical under the name of "pleiad." The pleiad consists of one gland larger than the rest, with one or two or half a dozen smaller glands, nearly all equally indurated on either side. The induration in some cases is not very strongly marked. They rarely become very large, varying from the size of a pea to that of a marble, and they retain their round or oval shape. They are freely movable under the skin, usually each distinct from the others. There is rarely any pain even on pressure, though slight tenderness may exist at first. This pleiad of indolent indurated glands may be (direct) unilateral, on the same side with the chancre or crossed, or (usually) bilateral, the glands on the same side with the chancre being most markedly affected.

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[1] Phagedena, although it destroys the induration, does not protect the patient from the subsequent development of his syphilis, any more than does the cauterization of a syphilitic chancre.

This induration of the glands exactly resembles, in its woody, ivory-like feel, the induration of the chancre, but in some cases is more soft and elastic, like cartilage or India-rubber. The induration appears during the second week of the existence of chancre. Fournier records, as unique, a case in which the induration of the ganglia was not detected until the twenty-seventh day after the appearance of chancre. Sometimes instead of the usual pleiad there is but a single indurated gland, perhaps as large as a nut. Another variation is the development of a single enormous syphilitic bubo, as large as an egg, on one or both sides. These were found by Bassercau on dissection to consist of an agglomeration of many separate glands matted together by large indurated lymphatic cords, and tough, thickened layers of connective tissue. Occasionally a hardened lymphatic trunk may be traced from the induration of the chancre, to the indurated glands. In strumous subjects the glands are apt to be very large, and to partake of the strumous degeneration as well as specific induration.

Submaxillary and axillary syphilitic bubo often consists of one very large, hard gland. The glands constituting syphilitic bubo usually reach their full development in from one to three weeks. They then remain stationary for several weeks or months, occasionally for over a year. They are habitually present when the first general eruptions appear, and may at this time undergo a sudden increase in size and induration. Sometimes, on the contrary, without known cause, the glands speedily return to their natural size, and all induration disappears.

Suppuration of syphilitic bubo takes place so rarely that it may be said practically never to occur. But the syphilitic as well as the healthy gland is subject to inflammation from injury, friction, or from inflammation of the chancre, and then suppuration may come on. Strumous glands also may degenerate, mat together, and slowly suppurate. When a syphilitic bubo suppurates, its pus is never auto-inoculable. With suppuration, there is of course pain in the affected gland. With "mixed chancre," suppurating bubo is not uncommon, and even virulent bubo may occur. Fournier thinks that pus once formed in a syphilitic bubo is more capable of absorption than in any other form of bubo. Syphilitic bubo bears no relation to the number or size of the chancres. Large buboes often become adherent to the skin. In three hundred and sixty-eight cases of syphilitic bubo, Bassereau saw suppuration in five per cent. Syphilitic bubo is so constant an accompaniment of syphilitic chancre, that practically it may be said to occur invariably. Fournier, in analyzing two hundred and sixty-five cases of syphilitic chancre, found ganglionic induration absent in five. Two of the individuals were very fat, and possibly the ganglia existed, but could not be found. The causes of the absence of induration in the glands are believed to be occasionally phagedena of the chancre (Fournier), the excessive smallness of the lymphatic glands in some fat people (Ricord); finally, in those rare cases where indurated chancre occurs a second time in patients who have had syphilis, the glands may not indurate. Syphilitic, spontaneous bubo (*bubon d'emblée*) does not exist. For diagnosis of syphilitic bubo, *see* DIAGNOSTIC TABLE.

Treatment.—The treatment of syphilitic buboes is that of early syphilis, but treatment has indeed little or no effect upon them, as they often persist long after the early cutaneous eruption has disappeared under treatment. Inflammation and strumous complications are to be met appropriately.

(*g.*) SYPHILITIC LYMPHITIS is a specific induration of the lymph-vessels and surrounding cellular tissue. Hard, smooth, and knotty cords are perceptible under the skin of the penis, feeling like the vas deferens, varying from the size of a knitting-needle to that of a goose-quill. They are insensitive to pressure, and the skin over them is not red. Starting in the induration of the chancre, they often do not reach to the root of the penis, but may extend to the ganglia. Sometimes, but rarely, the surrounding induration includes the blood-vessels. There may be one or more of these cords on one or both sides of the penis. Lymphitis, when present, generally precedes adenitis, coming on shortly after the induration of the chancre. It melts away usually during the disappearance of chancrous induration, lasting from three weeks to six months, and more. Rarely inflammation or suppuration may occur, but the pus is never auto-inoculable. If the chancre be mixed, so may be the lymphitis. Rollet states that syphilitic lymphitis occurs in about twenty per cent. of cases. No special treatment is necessary, except what may be required for inflammatory complications.

CHAPTER IV.

SYPHILIS.

Diagnostic Table of Syphilitic Chancre, Chancroid, Herpes, and Ulcerated Abrasion.—Of Syphilitic Bubo and the Bubo of Chancroid.—Of Syphilitic Lymphitis. and the Lymphitis of Chancroid.—General Syphilis.—Secondary, Tertiary, Malignant, Irregular, and Intermediary Syphilides —Prognosis of Syphilis.—Duration.—Influence of Gout and Scrofula upon the Course of Syphilis —The Ten General Characteristics of Syphilides.—Concomitant Symptoms of Secondary Syphilis.—Secondary Incubation, Syphilitic Fever, Alopecia, Indolent Glandular Engorgement, Sore-Throat, Analgesia.

THE following table is intended to serve as a summary of the broad, classical characteristics of syphilitic chancre and chancroid, with their accompanying buboes, as well as for the differential diagnosis of syphilitic chancre, chancroid, herpes, and ulcerated abrasions; of the bubo of chancroid, and that of syphilis; and of the different forms of lymphitis.

Syphilitic Chancre.	*Chancroid.*	*Herpes.*	*Ulcerated (Balanitic or other) Abrasion.*
1. *Nature.* — Always a constitutional affection.	1. Always a local disease.	1. Sometimes a local disease, sometimes a neurosis.	1. Always local.
2. *Cause.*—Sexual intercourse with a patient suffering from syphilitic chancre, or some secondary syphilitic lesion of or near the genitals, vaccination with syphilitic blood, accidental or designed inoculation of any vehicle containing the syphilitic virus, upon an abrasion of any portion of any tegumentary expansion.	2. Sexual intercourse with a patient suffering from chancroid of or near the genitals; accidental or designed inoculation with the secretion of chancroid, or that of virulent bubo.	2. Mechanical irritation, friction, as in sexual intercourse; chemical irritation, as of acrid discharges. As a sequence of cold, fever, or as an essential neurosis.	2. All of the causes mentioned for herpes, except the last three.
3. *Situation.* — Usually upon or near the genitals, not very infrequent on the head, hands, or nipple.	3. Very rarely encountered except on or around the genitals.	3. Of very frequent occurrence upon the genitals.	3. Same.
4. *Incubation.* — Constant, not less	4. None after absorption of the poi-	4. None.	4. None.

Syphilitic Chancre.	*Chancroid.*	*Herpes.*	*Ulcerated (Balanitic or other) Abrasion.*
than ten days, usually three weeks.	son. Ulcer usually fully formed on the second or third day; very rarely commences later than the seventh.		
5. *Commencement.*—Begins as an erosion or a papule, and remains an erosion or ulcerates.	5. Begins as a pustule or ulcer, and invariably remains as an ulcer.	5. Begins as a group of vesicles, rarely as a single vesicle, and remains as an ulcer.	5. Begins as an abrasion or fissure, and remains as an ulceration.
6. *Number.*—Usually unique or simultaneously multiple; never multiple by successive auto-inoculation; never confluent.	6. Usually multiple, both simultaneously and by successive auto-inoculation; often confluent.	6. Generally multiple, simultaneously and by successive crops of vesicles; sometimes confluent.	6. Generally multiple and confluent
7. *Physiognomy.* (*a.*) Shape: round, oval, or symmetrically irregular.	7. (*a.*) Shape: round, oval, or unsymmetrically irregular, with border described by segments of large circles.	7. Shape: irregularly rounded, with borders described by segments of small circles left by the different vesicles.	7. Irregular, of any shape, otherwise resembling superficial chancroid ulcer.
(*b.*) Lesion is habitually flat, capped by erosion or superficial ulceration; or scooped out; or deep, funnel-shaped ulcer, with sloping edges. Sometimes the papule is dry and scaly.	(*b.*) Always true ulcer, excavated, hollowed out.	(*b.*) Ulcer usually superficial; sometimes in solitary herpes there is but one vesicle, and the ulcer is absolutely circular (Fournier); in this case there are no neighboring patches of vesicles to clear up diagnosis. The base and general physiognomy of herpetic ulceration are, in other respects, similar to those of chancroid, but of less virulent aspect.	
(*c.*) Edges: sloping and adherent, sometimes prominently elevated.	(*c.*) Edges: sharply-cut, abrupt, often undermined.		
(*d.*) Bottom: smooth, shining.	(*d.*) Bottom: uneven, warty, irregular, without lustre.		
(*e.*) Color: sombre, darkish red, gray,	(*e.*) Color: yellow, tawny, false-		

Syphilitic Chancre.	*Chancroid.*	*Herpes.*	*Ulcerated (Balanitic or other) Abrasion.*
or black, lesion sometimes livid and scaly, occasionally scabbed.	membranous - looking, sometimes bright.		
(*f.*) Secretion: slight, sero-sanguinolent, unless irritation provokes inflammation and a supply of pus.	(*f.*) Secretion: abundant and purulent.		
8. *History.*—Not found on patients who have had syphilis previously.	8. Found indifferently upon all.	8. Found by preference upon patients with long prepuce and tender balano-preputial mucous membrane, often showing marked tendency to return monthly, fortnightly, or at irregular intervals after lack of cleanliness, a carouse, or unusual sexual intercourse.	8. Found indifferently upon all on the action of efficient causes. Most common on patients with long, tight prepuce, who are not cleanly in their habits.
9. *Inoculability.*—Not auto-inoculable without great difficulty, unless irritated, and secreting thick pus.	9. Readily auto-inoculable, producing characteristic chancroid ulcer by the third day.	9. Sometimes auto-inoculable with great difficulty, when secreting thick pus, producing abortive pustule, not characteristic chancroid ulcer.	9. Same.
10. *Course.*—Slowly progressive, cicatrization slow.	10. Rapidly progressive, cicatrization slow.	10. Does not usually tend to get much larger than the size at which it started; limitation and cicatrization rapid.	10. Same.
11. *Sensibility.*—Rarely painful.	11. Often painful.	11. Stinging heat at commencement.	11. Usually painful.
12. *Induration.*—constant, parchment-like, and very faint, or cartilaginous and extensive, terminating abruptly, not shading off into parts around, almost insensitive to pressure, movable upon parts beneath the skin, and not adherent to the	12. Absent in type-cases. An induration may be caused by irritants or by inflammation. It is boggy, not elastic, sensitive to pressure, shades off into surrounding tissues, is adherent to parts around, disappears promptly on healing	12. Inflammatory induration, capable of being produced by the same causes as in chancroid, and behaving in a precisely similar manner.	12. Same.

Syphilitic Chancre.	*Chancroid.*	*Herpes.*	*Ulcerated (Balanitic or other) abrasion.*
latter. Induration may disappear in a few days, usually outlasts the sore, and may remain for years in the cicatrix.	of the sore, or before that time.		
13. *Transmission to Animals.* — Not transmissible.	13. Transmissible with difficulty.	13. Not transmissible.	13. Not transmissible.
14. *Phagedena.*— May occur rarely.	14. Much more common.	14. Very rare, if at all possible.	14. Same.
15. *Bubo.* — Syphilitic bubo constant.	15. In about two-thirds of cases glands are unaffected, in the other third inflammatory or virulent bubo occurs.	15. Glands are very rarely involved. Inflammatory bubo may occur, virulent bubo is impossible.	15. Same.
16. *Lymphitis.*— Syphilitic lymphitis possible.	16. Inflammatory or virulent lymphitis possible.	16. Inflammatory lymphitis alone possible.	16. Same.
17. *Prognosis.* — For local consequences good, but syphilis follows.	17. For local consequences more serious; no after-effect.	17. Good in all respects.	17. Same.
18. *Treatment.*— Local treatment but slightly effective.	18. Local treatment curative.	18. Same.	18. Same.

Syphilitic Bubo.	*Bubo of Chancroid.*
1. *Nature.*—It is a specific affection, with peculiar characteristics.	1. It may be simple (inflammatory) such as might attend any inflammatory lesion, or virulent.
2. *Frequency.*—It is a constant symptom attending syphilitic chancre.	2. It is a complication occurring about once in three cases.
3. *Number of Glands involved.* — In those regions where multiple glands are found, it is generally poly-ganglionic; these may be unilateral or bilateral in the groin, rarely matted together into one large mass, but, when so, the latter retains the characters of indolence, etc.	3. Usually consists of a single gland in any region of the body. In the groin it may be bilateral. It is never a group of small, movable glands.
4. *Date of Appearance.* — It develops during the first or second week of syphilitic chancre.	4. There is no fixed period of appearance.
5. *Size.*—The glands are usually only slightly enlarged.	5. The gland is greatly enlarged.
6. *Induration.*—The glands are specifically indurated, feeling like cartilage or wood.	6. No hardness except inflammatory.
7 *Evidence of Inflammation.* — None;	7. Every appearance of inflammation

Syphilitic Bubo.	*Bubo of Chancroid.*
the glands are freely movable among the tissue. The skin is neither adherent nor red, nor is there any pain. The most prominent feature of the swelling is its indolence.	The gland becomes fixed (peri-adenitis), the skin adherent, the part feels hot, there is pain, the skin reddens, the prominent features are those of inflammation.
8. *Termination* always in resolution, except in occasional cases, where, from simple inflammation or strumous degeneration, suppuration ensues.	8. Termination occasionally by resolution, usually by suppuration. Virulent bubo invariably snppurates, and becomes an open chancroid ulcer.
9. *Auto-Inoculability.*—In cases of suppuration the pus is not auto-inoculable. The abscess does not become a chancre, or a chancroid ulcer. It does not extend, and never becomes phagedenic.	9. When the bubo is inflammatory, the pus is not auto-inoculable; where it is virulent, the pus is invariably readily auto-inoculable. Such an abscess becomes a true chancroid, and may extend or become phagedenic.
10. *Natural duration* is a few weeks or months.	10. Natural duration is a few weeks, or many months, as a chancroid; possibly years, if it becomes phagedenic.
11. *Prognosis* good as far as local results are concerned, but the patient invariably has syphilis.	11. Prognosis good for inflammatory, less so for virulent bubo, especially if it becomes phagedenic. In neither case does syphilis follow.
12. *Local treatment* ineffective, except for complications, general treatment of doubtful efficacy, but sometimes serviceable.	12. Local treatment useful and necessary to avert suppuration, cure chancroid left by virulent bubo, and lessen complications. Mercury harmful. Anti-syphilitic treatment absolutely useless.

Syphilitic Lymphitis.	*Lymphitis of Chancroid.*
1. Occurs only in case of syphilis, and has peculiar characters.	1. Exists as simple inflammatory lymphitis, or in virulent form; the former liable to complicate any inflammatory affection, the latter found only with chancroid.
2. Feels hard, like the vas deferens, of the size of a knitting-needle, or of a goose-quill; no pain, on erection, or on handling.	2. Some inflammatory hardness. Pain on erection, and on handling.
3. Skin uncolored.	3. Skin red over inflamed vessel.
4. Termination by gradual resolution. Very rarely there is suppuration; but, in such cases, the pus discharged is not auto-inoculable.	4. Termination by resolution or suppuration. Virulent lymphitis invariably suppurates, in which case the pus discharged is auto-inoculable, and the openings become chancroids.
5. Treatment unnecessary, and of little effect, except in case of inflammatory complication.	5. Local treatment advisable to quiet pain, avert suppuration, or limit extent and severity of chancroids left behind by the suppuration of virulent lymphitis.

GENERAL SYPHILIS.

Usage has adopted the name "primary syphilis" for the syphilitic chancre, and its accompanying adenitis and lymphitis. These manifestations, although the expression of constitutional poisoning, are never themselves general, but always strictly local. A chancre never does nor can appear elsewhere than at that point through which the poison first entered the body. Hence inherited syphilis has no primary stage, but is general from the start. The adenitis constituting syphilitic bubo invariably affects the gland or glands in direct communication with the lymphatic trunks coming from the chancre; the other lymphatic glands of the body, which may become indolently enlarged, do so only after the second period of incubation. The latter do not belong to the primary period, but form a part of general syphilis. And so of the lymphitis of primary syphilis, it affects only those vessels passing between the chancre and the syphilitic bubo.

Hence, primary syphilis, so far as its manifestations go, is purely local. Not so with general syphilis. There is no organ or tissue of the body through which it may not manifest its presence by symptoms, or upon which it may not exercise its power. The lymphatic glands all over the body may suffer, some habitually more than others. The skin from crown to sole, the nails, the hair (the teeth in inherited disease), and the mucous membranes, especially around the natural orifices, have their peculiar affections, due to syphilis. The eye and the testicle do not escape, and each and every viscus is liable to be invaded, as are all the tissues, connective, fibrous, muscular, cartilage, bone, brain, nerve, and vessel. Not only this, but the all-embracing arms of general syphilis include the functions as well, any of which may be disordered by it and each and all of the special senses may be perverted or destroyed—including the sexual appetite. The symptoms of all the forms of local, special, or general paralysis of motion or sensation, may be occasioned by syphilis. Finally, the intellect may succumb. Acute and chronic mania, dementia, lunacy, idiocy, all the above, and many more, form a category of symptoms comprehended under the one term general syphilis.

General syphilis has been arbitrarily divided into a secondary and tertiary stage. For convenience of description and treatment, such a division is a good one, and will be retained in this treatise.

Secondary syphilis includes all the earlier affections of the tegumentary expansions, cutaneous and mucous, and many of the lighter affections of the eye, testicle, and other glands, with some of the varieties of nervous syphilis.

Tertiary syphilis follows secondary, and consists of the later and the ulcerative skin-affections, the deeper lesions of connective tissue, muscle, bone, cartilage, and of tne internal organs (visceral syphilis), with the deeper and more serious lesions of the eye, testicle, brain, and all morbid conditions occasioned by what is known as gummy deposit.

The line between secondary and tertiary syphilis is not always well marked, and, although in typical cases the lesions become progressively deeper, commencing as mere efflorescences in the secondary stage, and gradually increasing in severity to the most extensive ulcerations, and destructions of bone and cartilage in the tertiary, yet some of the symptoms, naturally belonging to the secondary group, as the mucous patch and scaly eruptions, frequently crop out in the tertiary stage, while more rarely nodes come on with early syphilis, and occasionally most extensive ulcerative or other tertiary (gummy) lesions appear within the first few months after chancre, perhaps all the lighter secondary eruptions having been omitted.

This latter form, where tertiary symptoms come on in place of the secondary, is called "malignant syphilis." The former variety is known as "irregular syphilis."

Inherited and nervous syphilis will be described separately.

Certain of the eruptions which occur late in the secondary stage, and early in the tertiary, have been grouped by Hardy[1] under the title of "intermediary syphilides." The distinction drawn between secondary, intermediary, and tertiary syphilitic symptoms, is useful as a guide to treatment. Mercury as a rule is advantageous in proportion to the nearness of the symptoms, for which it is given, to the primary lesion (chancre), while iodine is nearly a specific for the later manifestations. The intermediary symptoms require both medicines combined.

Secondary syphilis lasts often a year, sometimes two, or more.

Tertiary syphilis (except as malignant) does not commence till after the expiration of at least one year from the appearance of chancre. It may never show itself, or may appear after a period of health of many years, often five or ten, sometimes as late as fifty-two (Fournier). There can be no absolute certainty about the dates of syphilis, or about what symptoms will appear. The whole secondary stage may be skipped under treatment, some late tertiary ulceration alone evidencing the fact that the patient had general poisoning at all.

CASE XLVIII.—In the fall of 1872 a robust-looking patient presented himself in a state of mental distraction, about an ulcer on his glans penis, not auto-inoculable, which had been pronounced lupus by his physicians, and for which extirpation, by a cutting operation, had been proposed. The ulcer was as large as a half-dime, eaten out deeply, with abrupt edges, hard base, etc., inguinal glands unaffected—in short, a typical tertiary ulcer. The patient was married, and had had a healthy child. His wife also was healthy. The ulcer had commenced as a hard spot, which fissured and ulcerated without much pain. The patient had not been untrue to his wife. The ulcer had existed for eight months, gradually increasing in size. Ulceration had been arrested once by caustic applications, but the cicatrix had shortly reopened. When told that the sore was syphilitic, the patient, on the authority of his physicians, laughed at the idea. He said that he had had chancre eleven years before, without suppurating bubo; that this chancre had been pronounced syphilitic by a reliable surgeon, and that he had taken mercury in pills for a while. He was an intelligent patient, and a close observer, and he declared positively that he had never had any eruption, or any symptom due to syphilis after his chancre, so far as he was aware. He stated, in further corroboration of his view, that during the summer (a few months previously), after the ulceration had existed for some time on his penis, he had had an attack of iritis. For this he had consulted an oculist, who, learning that he had once had a chancre, gave him mercury and iodide of potassium, the latter in gr. vijss doses, *until it upset his stomach*, so that he was obliged to fall to a lower dose, and, as he triumphantly asserted, although the eye got well after a while, yet the ulcer advanced steadily, "I taking as much iodide of potassium as the stomach would bear. Why, then, should not the ulcer have improved had it been syphilitic?" It was mainly on this account that the patient's former physicians had concluded that this ulcer must be lupus, since it could not be syphilitic, and evidently was no cancer.

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[1] "Maladies de la Peau," Paris.

The patient was answered that his ulcer was syphilitic, and had not gotten well, while his eye was under treatment, because he had not taken a large enough dose of the iodide of potassium. Local treatment was at once suspended, the patient was put upon a diet of rice-and-milk, with ten-grain doses of subnitrate of bismuth four times daily. No medicine was used except a saturated solution of iodide of potassium in water, āā ℥ j. Of this he took drop-doses at first, and ran it up by drops, largely diluting it before it was taken into the stomach, and using it only after meals, No change in the ulcer occurred until gtt.-xv doses were reached. Improvement was rapid at gtt.-xix doses; at gtt.-xx, the stomach rebelled, and the dose was reduced to gtt. xv, and then advanced to gtt.-xvii.

In six weeks the ulcer was cicatrized, thus establishing the diagnosis.

This case illustrates at once so many important points necessary to be considered in connection with syphilis, that it has been reported at length.

Syphilides.—The most conspicuous symptoms of general syphilis affect the skin, and are known as syphilides, or syphilo-dermata. The prominent primary lesion characterizing the cutaneous affection gives it its name, and in syphilis most of the confusing epithets of dermatology may be dispensed with. Thus, if a papule be the prominent lesion, or a vesicle, or a pustule, the affection is not necessarily called a lichen, or eczema or impetigo, but a "papular," "vesicular," or "pustular syphilide," as the case may be; adding "general," or "in groups," according to the physical distribution of the lesion. Ulcerated syphilides, again, are spoken of as superficial or deep, serpiginous or perforating, making the nomenclature of syphilis exceedingly simple, since the words themselves describe the affection.

Prognosis.—As to the character of the general syphilis, which is to follow upon a given chancre, the peculiarities of the individual have more to do with it than any thing else, excepting of course judicious treatment. Certain authors have advanced that phagedenic syphilitic chancre is followed by severe syphilis. The condition of the patient, allowing him to have phagedena, it is fair to presume, is also such as will cause him to suffer severely from his syphilis; but it does not necessarily follow, for the cause of the phagedena might have been a local one or one only acting temporarily, and then the succeeding general syphilis might be mild. Nor indeed does Diday's idea prove trustworthy, that the length of incubation of the chancre, or the length of secondary incubation, portends the character of the general syphilis which is to follow. There is undoubtedly a measure of truth in this, for, if the quantity or quality of the poison absorbed, or the state of the individual, be such as to allow the first local and general manifestations of the disease to be long delayed, it is reasonable to suppose that the whole course of the malady will be mild. The same natural inference may be made with some reason in connection with the mildness or severity of the chancre. But neither of these rules is reliable. Not infrequently we see cases of protracted, severe, obstinate disease attending a chancre of very long incubation. And the syphilide following the chancre which never ulcerates is sometimes more intractable than the same eruption following a large, excavated, ulcerated, primary lesion. Syphilis acquired from a mild case may be severe or mild. The following three cases will tend to demonstrate the fact that individual peculiarity has more to do with the form of syphilis than any thing else:

In 1865, in the cutaneous wards of St. Louis Hospital, under Prof. Hardy's care, were two cases, man and wife. The man had severe malignant syphilis, with large gummy deposits in his skin; some of them ulcerating; all occurring within a few months after chancre. This man had poisoned his wife while he yet carried his chancre. She had a very mild papulo-erythematous syphilide, bearing none of the characters of malignancy. The woman, from whom the man acquired his disease, was sought out and found. She also was a simple case of ordinary mild syphilis. The poison in these three cases was identical, handed directly from one to the other, but the results were so widely different that it would have been hard to convince a layman of their identity of origin. What the idiosyncrasy is which makes syphilis bad in one case and light in another cannot be affirmed. Scrofulous and strongly lymphatic individuals, although a little more prone to suffer from severe suppurative and ulcerative lesions than others, are by no means the only ones who have severe attacks. The most obstinate and long-enduring cases are frequently found in connection with the gouty diathesis, the predominant eruptions in such cases being scaly and tubercular, and nervous syphilis being not uncommon.

Perhaps the best light that can be thrown upon the question of prognosis may be derived, not from the time of appearance, but from the character of the first eruption of the secondary period. If this eruption be scanty and purely erythematous (roseola), or even papular, the case will probably be much more mild than if the earliest eruption were vesicular, or, still worse, pustular, especially if complicated early by iritis. Finally, if extensive tubercular eruptions and ulcerations appear in place of the usual secondary symptoms, the case is one of malignant syphilis, and the prognosis becomes grave. There is no just foundation for the opinion which has been advanced, that syphilis acquired from a secondary lesion runs a more severe course than if it were acquired from contact with a chancre. As far as the virulence of the poison is concerned, the converse of the above proposition would theoretically appear more probable, for the secretion of a syphilitic chancre seems more readily inoculable than that of secondary lesions. Further, it is certain that as the disease advances its transmissibility by inheritance declines. A syphilitic mother will abort in her early pregnancies, then produce a dead child at or before term; next a child who may die in a few weeks, with specific eruptions; then another who may have only mild symptoms of inherited syphilis; and, finally, in the tertiary stage of the mother, her children may be born healthy, and continue so indefinitely. Youth and strength do not insure a mild attack to a patient with syphilis, nor does age or debility necessarily imply a severe one.

Excesses of every sort, of wine, of women, of work, are liable to intensify the type and duration of existing syphilis. Climate also seems to have some influence. Treatment throws confusion into the natural order of appearance of the eruptions, postpones their outbreak, lightens their character, shortens their duration, and, in the most favorable cases, almost prevents them entirely.

All local irritations tend to call out eruptions at the points irritated, and to maintain them there. A child born with inherited syphilis may give no evidence of his malady until he is vaccinated, whereupon an eruption may speedily appear, become general, and be attributed to the innocent vaccination. A blister in the same way, even upon an adult, may call out dormant syphilis. Not infrequently a cold, great heat, any excess, a fatigue, an irritating or sulphur bath, friction, electrization, may be the exciting cause calling dormant syphilis into action and occasioning an eruption. Patients who work much with the hands are more liable than others to eruptions of the palms. Perspiration upon overlying portions of skin often intensifies a given eruption at such points, as under the female breast, around the umbilicus, between the scrotum and the thigh. Lack of cleanliness around the anus and under the prepuce is a powerful predisposing cause to mucous patches, while the use of tobacco chewed or smoked is proverbial for its power of originating and maintaining the same lesions in the mouth. A mucous patch of the tongue is often occasioned and indefinitely prolonged in a syphilitic subject by friction of that member against the rough edge of a tooth, and the suction of a baby on the nipple calls out mucous patches there. A knowledge of all these facts is of great importance in making a general prognosis.

Bad hygienic surroundings materially aggravate and prolong syphilitic manifestations, to such an extent, indeed, as often to render specific treatment absolutely unavailing or even harmful, until the patient is removed from such surroundings.

DURATION OF GENERAL SYPHILIS.—There is no disease so protean in its form as syphilis.

"Age cannot wither her, nor custom stale her infinite variety."

Syphilis finds expression through every tissue. Its symptoms simulate those of a vast number of other diseases, and some of its forms may be so obscure as to baffle accurate diagnosis without the assistance of the touchstone treatment. So true is this, that it has passed into a proverb among certain of the less well-informed of the profession, in face of an obscure disease, "If you do not know what to do, treat the patient for syphilis." The unscientific looseness of such a course needs no comment; but the existence of the proverb is the best argument to substantiate the protean type of syphilis. Only minute and careful investigation into the more obscure manifestations of the disease can lead to accuracy of diagnosis, which is of more importance in this than perhaps in any other malady. Hence the difficulty of saying when syphilis has ended, or indeed of deciding that it ever does end, since it so often permanently modifies the diathesis of the individual who has suffered from it. Syphilis may occur in so mild a form that the patient may never know he has it; or, again, with such intensity that extensive lesions of the skin, bone, and other tissues, may come on within the first year, with paralytic symptoms of great extent and severity. Syphilis may manifest itself as a mild eruption after chancre, disappearing possibly without treatment, and then (exceptionally, it is true) lie latent for many years, as long as fifty-two years,[1] to reappear with characters due only to syphilitic disease. In Fournier's case, a gentleman of seventeen had acquired chancre, followed by some secondary eruptions, which were pronounced syphilitic. No further symptoms had appeared until the age of sixty-nine—fifty-two years after the chancre—when he had suffered from syphilitic caries of the upper jaw. At seventy-two he applied to Fournier for a gummy tumor of the thigh, which got rapidly well under the iodide of potassium. Now, in this case, had the patient died at the age of sixty-eight, he might, with seeming justice, have been reported as an instance of cure, for over half a century would have intervened since his last syphilitic symptom.

This one case gives at a glance the practical answer to the whole question of the duration of syphilis. Every physician of any considerable experience with syphilis can recall analogous cases, though, perhaps, less striking. Syphilis, once acquired, stamps its impress upon the individuality of the patient, and becomes a part of him, and no power on earth in a given case can say when that impress disappears. A half-century may pass away and the trail of the serpent be still visible. This is a fact, and as such must be recognized. It is of vast practical importance, and to shut our eyes to it would be folly. That we do not so shut our eyes, even those of us who believe in an early and radical cure of syphilis, is sufficiently shown by the avidity with which, in doubtful cases of skin or bone disease, the history of the patient is carefully inquired into for a record of preëxisting syphilis, which, if found, no matter how distant, makes the diagnosis, establishes the treatment, and often leads to a cure.

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[1] Fournier, "Notes sur un Cas de Gomme syphilitique survenue 55 ans après le Début de l'Affection," Paris, 1870.

Yet, in spite of this assertion, who shall say that syphilis may not be cured? Occasionally cases are seen where syphilitic chancre is acquired a second time, followed by crops of secondary eruptions, and surely in these cases the old syphilis must have been cured, or the new one could not have appeared. Yet in some of these cases tertiary symptoms have been present when the second chancre was acquired, but this again only coincides with the evidence furnished by clinical observation: namely, that the virulence of syphilis disappears in the late tertiary period; that during this period neither the blood nor the pathological secretions will infect a healthy subject with the disease, and that such patients may be the parents of perfectly healthy children, who never manifest the faintest sign of syphilitic poisoning. The necessary conclusion, then, is this: that while symptoms which can depend upon no other disease than syphilis may crop out at any period during the life of a patient, who has once had syphilitic chancre, yet the virulence of the disease and its contagious properties do die away in time, what are left being more properly sequelæ in the received acceptation of that term.

The above is the possibility of the duration of the effects of syphilis, and must be recognized by every intelligent physician who wishes to accept facts and desires to view syphilis in a practical light. The probability of the disease in most cases, however, is that its manifestations will disappear finally after a few years, and this under intelligent management becomes almost a certainty.

Syphilis is no longer the terrible scourge it proved itself in the fifteenth century. It is rarely fatal except in the visceral form, and the majority of patients escape this stage entirely. It is hardly too much to state that, of the two diseases, gonorrhœa and syphilis, the former sends more patients to the tomb than the latter. Neither kills directly; both do so by their sequelæ. The classical mode of death as resulting from gonorrhœa is through stricture, to fatal bladder and kidney disease; and, whatever the ratio of deaths to attacks may be in the two diseases, it is highly probable that more deaths actually occur from gonorrhœa as their first cause than from syphilis.

Syphilis, again, has the advantage of being a manageable disease. Its symptoms yield to treatment far more readily than do those of any other chronic malady, and it is precisely in that period where the disease is most destructive to tissue and to life, the tertiary stage, that remedies are the most brilliantly effective. Syphilis, as encountered in the higher walks of life, is a mild but terribly lurking and insidious disease. It may escape attention altogether. Many ladies come by it honestly, but never know they have it. Children develop some obscure symptoms; the significance of which escapes not only the parents but also the family physician; and even a man may get chancre, followed by some light eruption, consider it of no importance, and get well spontaneously, marry, and have healthy children, himself remaining entirely free from any evidence of the disease, and dying in a green old age.

Practically what the physician wants to know is this: during what time are symptoms liable to recur before that long latent period may be expected, which is to terminate all manifestations of disease, and in which the patient is certainly well, probably cured? Or, still more practically, the question may be put: If a patient presents himself with syphilitic chancre, at what period may he safely marry?

Roughly, and on the average, this last question may be answered by saying, after about two and a half years, or to be safe regarding marriage, one year after the disappearance of the last syphilitic symptom, treatment having been continuously kept up, and being continued until after the birth of the first child. This may be said, because well-managed syphilis usually ceases to relapse in about that time. Those patients most often do badly, other things being equal, who follow irregular and uneven courses of treatment, now pushing medication to excess, in the hope of killing the disease, which is impossible, now giving up all treatment in despair. It is very rare for bad symptoms to appear upon a patient who falls into the hands of a conscientious physician, one who recognizes that the disease cannot be jugulated, that the eliminative and not the abortive treatment must be followed, and who quietly and steadily pursues the enemy through its periods of repose, as well as during its moments of eruption, confident that, by mildly and persistently keeping up this treatment by extinction, he will triumph at last over the disease. In mild cases so treated there may be but one faint eruption, or perhaps but a few little spots, with epitrochlear, glandular induration and a few mucous patches, to mark the disease, the whole of the symptoms only lasting a few months after chancre, and the patient's after-life being healthful. This, however, is the exception. Ordinarily some mild symptoms continue to crop out from time to time, for perhaps on an average two to three years, after which comes the period, be it cure or not, during which the patient bears all the marks of health, is unable to communicate the disease, and reproduces healthy offspring.

Finally, there are exceptional examples where late tertiary symptoms appear after long years of latency, as already observed; of malignant syphilis which is controlled with difficulty by treatment; and, of other inveterate specimens of disease where relapse after relapse follows through long series of years, perhaps in spite of a continuous intelligent treatment.

These last cases may be mostly ranged under two heads:

1. Those living in bad hygienic surroundings, and giving themselves up to excesses of every sort.

2. Patients possessed of a strong tendency to gout, or of decidedly scrofulous diathesis.

INFLUENCE OF GOUT AND SCROFULA UPON THE COURSE OF SYPHILIS.—Both gout and scrofula may exercise a disturbing influence upon the course and the manifestations of syphilis. In the rheumatic or gouty subject the cutaneous symptoms partake of the gouty type. They are apt to be dry, erythematous, papular, tubercular, scaly, of a particularly livid red, of great chronicity, leaving much pigmentation behind. Certain purely gouty eruptions are almost indistinguishable from similar ones produced by syphilis, and these, when occurring upon a patient who has had syphilis, give rise to great difficulties of diagnosis, and are most often mistaken for syphilides and treated as such, either without effect or until they spontaneously disappear, when the specific medication gets the credit of the cure. Such gouty eruptions are the dry, papular patches or single papules about the hands, on the palms or back, upon the feet or elsewhere; scaly patches, generalized papular and scaly livid eruptions on the extremities or back, especially such as occur during the spring or fall, and during the heats of summer (from the acridity of the perspiration). The different forms of psoriasis, as seen upon an individual of the gouty habit, possess many of the characteristics belonging to syphilitic eruptions, and often lead to error. These eruptions which have been just mentioned do not itch (as a rule), and their diagnosis (when found upon a syphilitic patient), from inspection alone, is always difficult, sometimes impossible. Treatment may be required to solve the problem. Syphilides on a gouty patient get well quite promptly, while other eruptions are not sensibly affected by antisyphilitic remedies.

Besides this simulation of syphilis by certain gouty eruptions, whether they occur on a patient who has had syphilitic chancre or not, the gouty diathesis tends to make the type of syphilis an obstinate one. During the employment of treatment, and in spite of it, in some such cases, a new eruption will crop out, while the tendency to relapse, and to the recurrence of scaly, papular, and tubercular patches is sometimes disheartening. Finally, the gouty diathesis seems to predispose to the development of nervous symptoms in syphilis, both of the rheumatic order in early disease (pain), and to lesions of bone, of fibrous tissue, and, later on, of nerve-substance, such as furnish the different forms of paralysis.

Scrofula, on the other hand, leads to moist eruptions in syphilitic poisoning, the vesicular, pustular, early and late ulcerative. Most of the lymphatic glands become involved, but they are usually not so markedly indurated. The eruptions are often slow in coming out, and slow in getting well. The cicatrices of ulcers are not so liable to be deeply pigmented; they are often somewhat irregular, puckered, ridged and drawn like the scrofulous cicatrix, unlike the round, depressed, smooth, thin, glistening, non-adherent, characteristic cicatrix of syphilis. The type of the whole disease is apt to be slow, chronic, pustular, ulcerative, inveterate, often attended by destructive bony lesions. Again, in a syphilitic patient, a gland may suppurate, and then ulcerate with all the appearances of struma about it, and yet yield only to anti-syphilitic treatment.

General Characteristics of Syphilides.—All the syphilitic affections of the skin have certain general characteristics which stamp them as a class. Every mark is not possessed by each eruption, yet the majority belong to each and every syphilitic lesion of the skin. They are usually well marked, and may be grouped under ten heads:

1. Polymorphism of the initial lesion.
2. Rounded form of the patches of eruption, and of the ulcers.
3. Livid color, like the meat of raw ham, then coppery (pigmented), then gray, then white.
4. Absence of pain and itching.
5. Earlier eruptions superficial and generalized, usually symmetrical.
6. Later eruptions in groups, involving the cutis vera.
7. Scales white, usually not adherent, superficial.
8. Crusts greenish, black, irregular, thick, adherent.
9. Ulceration with abrupt edges, adherent, not undermined, sluggish, and bleeding easily.
10. Cicatrix rounded, depressed, thin, non-adherent, white, smooth at first, often pigmented, then clearing off from the centre toward the circumference.

To these special characteristics may be added for the earlier outbreaks, the general accompanying phenomena of syphilitic fever, alopecia, headache, osteocopic pains (worse at night), analgesia, anæsthesia, indolent lymphatic ganglia, iritis, sore-throat, and mucous patches in, upon, or around the natural orifices:

1. *Polymorphism.*—This applies to the earlier and generalized eruptions. With other cutaneous diseases, it is the exception to have an eruption composed of many elementary lesions; with syphilis it is rather the rule. An erythematous syphilide is usually also at the same time partly papular. The papular furnishes examples of erythematous spots, and very often some vesicles, some pustules, and some scales, and so of the other generalized eruptions. This is partly accounted for by the fact that the elementary lesion often develops in successive crops, and therefore shows during its different stages as an erythema, a papule, a vesicle, a pustule, a tubercle, or a scaly spot. One lesion, however, always exists in excess, and from this lesion is the eruption named—as, papular syphilide.

2. *Rounded Form.*—In a generalized eruption the groups of elementary lesions are gathered into rounded clusters, but this is more specially shown in the later circumscribed syphilides, be they groups of

papules, vesicles, pustules, tubercles, or indeed ulcerations. The tendency to a rounded form of the group is marked.

3. *Color.*—The color of the syphilides is not a frank, inflammatory red, but a vinous, empurpled redness, resembling, when well marked, the raw meat of ham. This color is found also in many of the gouty, papular eruptions, and in psoriasis, rarely with other eruptions. The color of the syphilides passes by pigmentation from the dusky, violet-red, into what is known as copper-color, and from there on sometimes, by a deep pigmentation, to brown or black, the skin around the lesion being usually also pigmented to a certain extent. This pigmentary coloration sometimes lingers for years, but usually clears off after a few months, disappearing first centrally, the clearing off extending peripherally in all directions. Finally, the spot becomes brilliantly white.

4. *Pain and Itching.*—The syphilides are not accompanied by any itching or pain; neither the eruptions nor the ulcers ordinarily furnish any disagreeable subjective sensations. Occasionally there are some heat and prickling with an eruption as it is coming out, but it never amounts to actual itching. Syphilitic ulcerations are also free from pain, except as occurring upon dependent portions of the body, where the imperfect circulation tends to set up some inflammation around or in the throat, where the constant motion seems often to lead to the same result. This absence of subjective phenomena is of great importance in diagnosticating syphilitic eruptions. Errors, however, are liable to occur with gouty and scrofulous eruptions, most of which are also entirely devoid of pain or itching. Other features, however, distinguish the latter. Sometimes eruptions are seen which, although evidently syphilitic, are yet attended by itching. In such cases an attentive inquiry will usually disclose the cause of the exceptional peculiarity. The patient may be found to have a naturally irritable, itchy skin, a pruritus which always troubles him, and which the syphilitic eruption by no means relieves. He may be afflicted with urticaria along with his specific eruption. Not uncommonly, in hospital patients, prurigo from pediculi coexists with some syphilitic exanthem.

CASE XLIX.—In a curious case observed at the Charity Hospital of this city, the patient had chancre and gonorrhœa. He took by mistake an overdose of copaiba for his gonorrhœa, whereupon copaibal roseola developed, which itched terribly, causing the patient to leave the marks of his nails on many parts of his body. The copaibal erythema was just subsiding when a syphilitic roseola declared itself, the marks of nails were still upon the patient's body, and he believed that his present eruption was the same one he had been suffering from, and consequently asserted positively that it itched. Obervations, however, proved the contrary, for, as the syphilitic roseola developed, and the copaibal exanthem decreased, all itching ceased.

Contrary to the rule, the earlier syphilitic eruptions of the scalp are usually attended by itching.

5. *The earlier eruptions* are distributed habitually all over the body, and are superficial, mainly congestive in character. There is no

alteration, nor any destruction of tissue, as proved by the fact that the earliest eruptions (erythematous and papular) leave no scars. Those coming a little later leave faint scars (pustular and vesicular). The development tends to be symmetrical, the eruption coming out on the flanks and sides of the thorax, the forehead, along the edge of the hair, on the sides of the nape, and the margins of the nostrils, on the palms and soles, etc.

6. *The later eruptions* are grouped; tubercle, pustule, or ulceration, whatever be the lesion, it is now no longer generalized, but gathered into groups; and that the lesion is deep and there is destruction of tissue, are shown by the depression of the cicatrix. These lesions usually leave a scar whether they ulcerate or not, and this distinction of leaving cicatrices without previous ulceration is enjoyed by no other class of eruptions save one, the scrofulous. A tubercular *non-ulcerated* lupus will also leave scars, but such scars are the irregular, stretched, burn-like cicatrices of lupus, and not the round, depressed, white scars of syphilis.

7. *The scales* on the cicatrices, and on the patches of scaly syphilitic eruptions are thin, white, non-adherent, lamellar, very different from the dense, thick, imbricated, adherent scales of psoriasis.

8. *The scabs* formed on syphilitic, ulcerative, rupial, and pustular lesions are rough and adherent, dark-colored, of a greenish black, sometimes loosened by an underlying accumulation of pus, but more often seemingly set into the skin, and tightly adherent. They may be of light color where the lesion has been pustular, but, light or dark, the green shade is rarely totally absent, and is often brilliantly marked.

9. *Characteristics of Ulcers.*—With the exception of the chancre and of the ulcerated mucous patch (both of which may vegetate, and are always liable to be elevated instead of depressed), the ulcerations of syphilis resemble chronic, indolent ulcers. They are rounded or oval, with abrupt edges cut away like those of a chancroid, the base is covered with the yellowish, false-membranous-looking deposit, sometimes bluish, like boiled sago. The edges and base of the ulcer are usually hard, and the former generally, but not invariably, firmly adherent, and not undermined as in the ulcerations of scrofula. These ulcers do not bleed easily, are generally atonic and sluggish, and usually entirely painless. Apparent exceptions to the rule in regard to pain are often due to the dependent position, or other cause sufficient to excite inflammation, or to the situation of the ulcer over a bone, the periosteum of which latter is suffering from painful syphilitic disease.

10. *The cicatrices* of such syphilitic lesions as have destroyed tissue, whether there has been any surface ulceration or not, are generally rounded, very thin, depressed, smooth, shining, and non-adherent. They are usually at first uniformly pigmented, of a coppery hue, more or less deep (nearly black in brunettes). This pigment clears off from the centre to the circumference until only a dark border is left, which some-

times lasts for months, but finally the whole cicatrix acquires almost a pearly whiteness. Cicatrices over bone may adhere if they have been connected with bone lesions. The cicatrices left by an ulceration partaking of the nature of both syphilis and scrofula (p. 544) are often complex, that is, a scar irregular, uneven, bridled on its surface, contracted in parts, not much pigmented, perhaps with a vein running across it, and often adherent at points; possessing, in a word, some of the characters of a strumous cicatrix added to those due to syphilis. These complex cicatrices are best marked about the neck, where glands have suppurated on strumous subjects who are also syphilitic, and are not very uncommon after rupia.

CONCOMITANT SYMPTOMS OF SECONDARY SYPHILIS.—The phenomena which most frequently precede or accompany the first cutaneous out-breaks are syphilitic fever, indolent engorgement of the lymphatic glands, headache, osteocopic pains, alopecia, and sore-throat, with mucous patches, and perhaps iritis. A few words will serve to describe these symptoms. They follow the period of secondary incubation.

SECONDARY INCUBATION.

Primary incubation (as already described, p. 512) extends from the moment of suspicious contact to the appearance of the chancre. Then primary syphilis is ushered in; but now there is another period of rest, wherein the disease seems to be purely local, for there are no general symptoms. This period dates from the appearance of the chancre to the appearance of general symptoms. It invariably exists whether treatment be commenced or not, and has been named the period of secondary incubation. Primary syphilis may, and often does, extend through this whole period, and even longer, but still it is a period of incubation, for the general organism shows no sign of suffering until a lapse usually of many days. The shortest length of period of secondary incubation yet reported is twelve days (Rollet); that is, twelve days elapsed after the appearance of the chancre before any general symptoms became evident. Rollet observed it again of one hundred and thirty days' duration. The mean length of the period is forty-six (Diday) or forty-seven (Rollet) days, as established both by experiment and clinical experience. This period may often be lengthened materially by the intervention of early treatment, but even then it is customary for some slight eruptive disturbance to appear about six weeks after the advent of chancre.

SYPHILITIC FEVER.

About a week or more before the appearance of any eruption, while the chancre is perhaps showing signs of getting well, the patient is liable to exhibit more or less marked symptoms of fever, but, as in nearly all of the symptoms of syphilis, so in this one, the intensity varies in different cases from nothing upward. The poison of syphilis is at work during the period of secondary incubation, and produces more or less cachexia by directly diminishing the quantity of the red corpuscles of the blood. Grassi, the enterprising apothecary of the Hôtel Dieu, by frequently repeated analyses found this diminution of the red corpuscles to vary in different cases from eleven to sixty-five per cent., and noted, also, that the percentage of corpuscles increased under the administration of the iodide of potassium. Some diminution of the red corpuscles seems to be constant; but, while it varies greatly in cases where no treatment has been employed, under early judicious treatment the amount of decrease is certainly less. This syphilitic hydræmia, then, is constant, but it may be so slight as not to be accompanied by any observable fever; while, again, the amount of febrile disturbance may be excessive. Hence it sometimes appears that syphilitic fever, as such, is entirely absent. Lancereaux believes that it is present in two-thirds of all cases. When present, as distinct fever, it is marked by physical and mental depression, loss of appetite, functional disturbance of the primæ viæ, and a temperature running up in the evening, according to Guntz,[1] often to nearly 104° Fahr., but falling again rapidly after a few days.

The fever may be continuous, or may occur in paroxysms, chiefly toward night, followed by sweating. The type of the fever may be also remittent, or even occasionally intermittent, with regular tertian paroxysms of chill and fever. Again, the fever may be low and typhoid in type. Sometimes it is accompanied by nausea, hebetude, and stupor; or, again, the patient may feel quite comfortable and as well as usual, retaining his appetite, or even eating more than his ordinary amount of food—boulimia (Fournier). Whether there be much or little true fever, the hydræmia commonly announces itself by sallowness of the complexion, with pallid face, pinched features, and sunken eyes. The nervous depression is sometimes prominent, occasioning melancholy, with sad looks, a gloomy view of life, even to a tendency to suicide. The patient exaggerates his sufferings, and is often wofully depressed, complaining of general *malaise*, fatigue, and feebleness. Paroxysmal or continued neuralgia, vertigo, feelings of faintness, may come on; these perhaps spontaneous, or, again, provoked by movements of the head. Where the hydræmia is marked, shortness of breath is complained of, and palpitation; a soft, blowing sound may be heard at the base of the heart and in the vessels of the neck. Epistaxis and œdema of the feet, perhaps, occur.

With or without these symptoms of hydræmia, pain is almost constant in syphilitic fever and during the earlier eruptions. This pain usually affects the fibro-osseous system, and is known as osteocopic (ὀστέον-

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[1] "Das syphilitische Fieber," Leipzig, 1878.

κόπτειν, bone-breaking), on account of its peculiar intensity. It assumes a multitude of forms, occurring in the nucha, back, loins, between the ribs, constituting a pleurodynia sometimes mistaken for pleurisy, in the shoulders, elbows, knees, and sternum (Baglivi). These pains are movable sometimes, shifting rapidly from one part to another. They may occur only at night, or may be continuous, in which case they are often decidedly worse at night. Pressure sometimes affords them temporary relief, or, on the other hand, evokes them where they are not spontaneous. A diagnostic value has been attached to the fact that pressure over the lower or upper third of the sternum produces pain not otherwise complained of. Among the pains of early syphilis, headache is prominent, often of an excruciating character and usually worse at night. The joints may stiffen and be hard to move, on account of pain. Effusion occasionally occurs in and around them, giving to syphilitic fever the aspect of mild acute inflammatory rheumatism. Jaundice may perhaps come on during or just before the outbreak of eruption, rarely lasting over a few weeks, and due to hepatic engorgement, or, possibly, as Lancreeaux suggests, to compression of the bile-duct by enlarged lymphatic glands, since this cause is certainly sufficient to produce icterus occasionally in advanced syphilis. The pulse of syphilitic fever rarely reaches higher than 120°. The fever is usually greater according as the eruption is early and abundant. Sometimes it quickly abates and disappears as the eruption comes out, or it may continue and get worse for weeks. Occasionally there are some slight feverish symptoms just before other crops of eruptions which succeed the first general outbreak.

The diagnosis of syphilitic fever is made by a study of the history of the case.

Treatment is mainly tonic and hygienic; these means being persistently pushed while the general treatment of syphilis is kept up. Anodynes are sometimes required to master the pains. Although Grassi found that the number of red blood-corpuscles did not increase under the administration of mercury, yet this remedy, carefully, mildly, but persistently used (never pushed to salivation), usually seems to shorten the attacks, and, if commenced soon after the chancre appears, seems able to prevent the fever altogether.

A few words will suffice for the other ordinary concomitants of the earlier general syphilides, alopecia, general indolent glandular engorgement, sore-throat, iritis, mucous patches, paralysis, anæsthesia, analgesia, boulimia, jaundice.

ALOPECIA.

Falling of the hair due to syphilis is of two kinds. Where there are scabby sores on the scalp, and especially in later ulcerative disease, the hair-follicles, over limited areas, become destroyed, in which case the fallen hair is not reproduced. Ordinarily, however, general baldness occasioned by syphilis is only temporary. In fact, baldness is not usually produced, but only a considerable thinning of the hair, not only of the scalp, but of the eyebrows, eyelids, whiskers, and, to a degree, of the whole body. This thinning of the hair is due to two causes:

(1.) The syphilitic hydræmia, which, like thin-bloodedness from any other acute cause (fever), temporarily impairs the vitality of the hair-papillæ, causing the hair to lose its lustre and then to fall out.

(2.) A seborrhœa, the sebaceous matter clogging the hair-follicle, pressing upon the papilla, ultimately leading to the fall of the hair, and possibly, in some cases, to the atrophy of the papilla. The dried sebaceous matter mixed with scales may usually be scraped away plentifully from the scalp around the hairs.

Treatment.—Although some falling off of the hair is often inevitable, yet the quantity may be lessened by attention to the hygiene of the scalp, shampooing once a week with a little ammonia in warm water (a teaspoonful to the pint) to get rid of the accumulating sebaceous matter, and the use afterward of a stimulating lotion, of which a little may be rubbed upon the scalp nightly. One of the best of these is:

℞.	Tr. capsici,	ʒ ij.–v.
	Glycerini,	ʒ j.
	Aquæ Cologniensis, ad.	℥ j. M.

Where sores infest the scalp, general treatment alone is to be relied upon.

INDOLENT GLANDULAR ENGORGEMENT.

Coincidently with the first outbreak of general syphilis, sometimes preceding the eruption, more often shortly following it, there is a marked tendency to a general indolent engorgement of the lymphatic glands. This concomitant symptom rarely fails, and it furnishes a diganostic mark of the first importance in all doubtful cases. The enlargement of the glands does not necessarily depend upon the occurrence of an eruption, since it is encountered where close observation fails to detect any neighboring exanthem. This is particularly true of the post-cervical and epitrochlear glands. The engorgement of the glands is indolent, painless. They are usually of a cartilaginous hardness, insensitive to pressure, varying in size from a small pea to a marble.

The coincident indolent engorgement of certain glands is almost pathognomonic of syphilis. These are the post-cervical (posterior chain), markedly two little glands lying high up on either side of the nucha, upon the occipital bone; a gland over the mastoid process of the temporal bone; and the epitrochlear gland (or glands) on either side, just above and without the inner condyle of the humerus. Other glands may also become indolently engorged, but more rarely; as, the lateral or the cervical, the axillary, the inguinal (where the chancre is extra-genital, and where these glands consequently have escaped primary infection); but the glands of most assistance to diagnosis are undoubtedly the post-cervical and epitrochlear, and these should be sought for in all cases to confirm the diagnosis of general syphilis.

SORE-THROAT.

Sore-throat is a concomitant symptom of all stages of general syphilis. There are three type varieties:

1. A diffuse general redness, with or without ulceration.
2. A certain amount of chronic congestion, and brawny thickening about mucous patches or atonic ulcers.
3. Destructive ulceration from gummy deposit.

The first variety is an early secondary phenomenon, and alone of the three is a concomitant of the early syphilides; the second may occur along with the later secondary and earlier tertiary lesions; the third is tertiary. They will be described in connection with the other symptoms.

Recently Fournier[1] has noted, as a concomitant symptom of the earlier secondary period of syphilis, certain aberrations of cutaneous sensibility, such as loss of ordinary cutaneous sensitiveness (anæsthesia), inability to appreciate the sensations of heat and cold, and complete insensitiveness to pain (analgesia); these either general or more commonly confined to limited areas of skin, notably the extremities. The back of the hand over the wrist is a favorite location. The trouble is a passing one, not lasting more than a few months, and has been observed by Fournier chiefly in women. It is questionable whether hysteria may not often play a prominent part in the causation of these phenomena. Fournier's observations include over a hundred cases.

Iritis concludes the group of concomitant symptoms. It will be described later.

CHAPTER V.

GENERAL TREATMENT OF SYPHILIS.

Hygienic, Tonic, Specific Treatment.—Syphilization.—Treatment of Early Syphilis.—Bad Effects of Mercury.—Methods of administering Mercury.—Treatment of Late Syphilis.—Mixed Treatment.—Treatment by the Iodides.—Methods of administering Iodine in Syphilis.—Quantity of Iodide which may be required.—Duration of General Treatment.

THE general[2] treatment of syphilis is hygienic, tonic, and specific. The latter is often ineffective unless aided by the former. Neither should be depended upon alone. They form component parts of one rational system.

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[1] "Annales de Dermatologie et de Syphilographie," tome i., 1869, p. 486. "Sur la Syphilis," Paris, 1873.

[2] The local and special means required for the different manifestations of the disease will be detailed under the heads of the symptoms requiring them.

Hygienic Treatment.—The hygienic treatment of syphilis includes all the ordinary laws of health. Regularity of the habits—especially of those of eating and sleeping, and of those involved in the performance of intestinal functions—is all-important. No deviations need be made from ordinary diet. Excesses of any kind are bad, even emotional (fear, anger), and especially excesses in strong drink, in work, in venery. The function of the skin should receive attention through scrupulous cleanliness. Warm baths are more cleanly and relaxing to the skin than cold. If baths be too hot early in the disease, they are apt to call out a more plentiful crop of eruption. Catching cold should be avoided. It is apt to induce and prolong mucous and ulcerative patches about the mouth, nose, and throat. Singing, and loud and continuous talking, are objectionable in subjects having weak throats. Experience has taught that tobacco in all forms, and even highly-seasoned food, is certainly injurious, in irritating and keeping up an outcrop of mucous patches. Air, exercise, and light, essentially necessary to all animal well-being, are particularly so in the case of obstinate chronic or advancing disease. Change of air in some of these cases is essential to the success of treatment, as a trip to the country, change from the seaboard to the mountains, or from inland to the shore, and then perhaps back again, six weeks being usually long enough in any locality to obtain its maximum effect for good.

Case L.—A gentleman of twenty-four, of fair general health, tall, slight, pale, somewhat lymphatic in aspect, applied for treatment of a large lump on the forehead, nasal catarrh, and a yellow ulcer of the soft palate. He had been under treatment for some time for scrofula. Daily local applications had been made to his ulcer. He suffered no pain. His appetite was excellent. The most scrupulous examination and careful inquiry failed to elicit any history of syphilis, except a urethral discharge coming three weeks after exposure, for which he took capsules; and a little sore-throat within six months afterward. He never had been treated by mercury, or otherwise for syphilis, which he was unconscious of having. There was a painful node on the left ulnar, nodes on the tibiæ; the bones of the bridge of the nose crackled when touched, and had already begun to sink in. The fluctuating tumor (gummy) on the forehead was painless. The ulcer of the palate was rapidly perforating, and characteristic in appearance.

He was put on tonics, cod-liver oil, and the iodide of potassium. Five grains of the iodide produced a profuse eruption of purpura of the feet and legs. On this account he went to the country, continuing his iodide, and with directions to increase it. Within twelve hours after reaching the country, his purpura ceased coming out, he was able to increase the dose of the iodide, and all of his symptoms improved. Within a few weeks the ulcer in his mouth healed, the lump on the forehead greatly diminished; he had gained flesh and strength, and concluded to return to the city. Shortly after doing so he was obliged to decrease the dose of the iodide; new crops of purpura appeared daily, his nasal discharge ceased to improve. Again he sought the country, again his purpura promptly ceased, and he went on to recovery.

Many equally instructive illustrative cases might be detailed. The rule is positive. Many obstinate bad cases of late secondary and tertiary disease, which fail to respond to treatment in their homes, especially if that home be in the city, make rapid strides toward recovery, as soon as the air and surroundings have been modified.[1] Mercury and the iodides will not cure all syphilis, as many practitioners seem to believe. The old chronic cases, remaining from year to year in our large hospitals, and relapsing endlessly in the damp and crowded tenements of our large cities, are not in need of medical treatment, for this they have and of the best; but what they need is intelligent hygiene, and with its assistance many of them would recover.

Tonic Treatment.—In the same category with hygiene belongs all tonic and supportive medication. Cod-liver oil, iron, quinine, and all lesser helps, find ample space to vindicate their claims at some part of the treatment of most cases. Without them specific treatment is often unworthy the name. In the hydræmic stage, just before and during syphilitic fever and the earlier exanthemata, as well as during portions of the later cachexiæ, these remedies outrank the specifics, and are indeed occasionally used alone and to advantage, until the general tone of the patient can be elevated; after which the prompt efficiency of the specifics, intelligently administered, gives them a claim to the title of being the most reliable drugs used in the practice of medicine. There are, however, certain phases of syphilitic cachexia over which no tonics act with the same efficiency as minute doses of mercury, especially corrosive sublimate, in women preferably combined with iron.

Specific Treatment of Syphilis.—But few known remedies have been left untried in the treatment of syphilis. Even condurango, the last startling therapeutical novelty, claimed to eradicate it. The claims of few of these need detain us. Most of the syphilides, especially the earlier varieties, are self-limiting, and will get well under any treatment, one might even say in spite of treatment. Mild cases, especially in married women, often go untreated, unrecognized indeed, and the patients never suffer any considerable inconvenience. It is on cases of this order that anti-mercurialists build their theories, substantiating the latter by reference to cases, in themselves inveterate and malignant in spite of the use of mercury, or perhaps in connection with its improper use. No treatment may be better than over-treatment.

The different vegetable decoctions and infusions, of which sarsaparilla takes the lead, assist digestion, promote the action of the skin, encourage the functional activity of the kidney, and please the patient. They may be adjuvants in certain cases, and should be perhaps ranked along with hygienic and tonic means, but they have not merited by their action any right to the term curative in its narrowest sense, since they do not demonstrably postpone relapses or shorten the duration of existing symptoms any more than other hygienic and tonic means. Bumstead speaks favorably of Zittmann's decoction (which also contains mercury), from ℥ viij to xvj daily, enough to produce free catharsis in some "inveterate cases," believing that it increases the appetite and improves the patient's general condition.

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[1] We have repeatedly demonstrated the value of the truth contained in the above lines.

To the same order of treatment belong diaphoretics and the action of baths, both useful undoubtedly, but strictly belonging to the class of adjuvants.

Of syphilization, that is, the attempt to eradicate syphilis by the rapid, indeed exhaustive reproduction of ulcers upon the patient by the use of pus taken from an auto-inoculable source, usually chancroid,—the process is founded upon an inaccuracy. Its premises are scientifically inexact, for chancroid is not syphilis, any more than is nettle-rash the itch. Its effects are produced not upon the principle *similia similibus*, but upon that which regulates the power that issues and setons sometimes have over certain cutaneous affections. The skin becomes exhausted as to its power of maintaining an eruption. This same effect has been produced by the establishment and maintenance of ulcers with tartarized antimony, a method of treatment named, satirically, "tartarization." That an eruption may fade promptly under treatment by syphilization is highly probable, but this is only one of many symptoms of syphilis. Other eruptions and other symptoms are not prevented, and the treatment itself is physically repulsive, painful, and certain to leave more indelible cicatrices upon the integument than would a serious attack of syphilis allowed to go untreated.[1]

The specific treatment of syphilis consists in the intelligent administration of mercury and of some of the preparations of iodine. It is divided, for convenience of description, into—

1. Treatment of early syphilis;
2. Treatment of late syphilis—mixed treatment.

The proper duration of treatment will be discussed at the end of the section.

1. TREATMENT OF EARLY SYPHILIS.

General treatment should be commenced as soon as the diagnosis of syphilitic chancre is made. There is no object in waiting for an eruption. By so doing, valuable time is lost. Still, early action is only justified by an absolute certainty of diagnosis. In all cases of doubt the honest surgeon must hesitate, and many cases are doubtful at first. In all such it becomes the duty of the surgeon and of the patient to wait for absolute proof of its presence before treating a disease which possibly may not exist. By following the opposite course the surgeon perhaps throws doubt and discontent, sometimes even torture, into the whole subsequent life of the patient, who is constantly alarmed by every pimple, every ache, every unusual feeling he may have through life, fearing it may be the beginning of the long-delayed onslaught of his imaginary foe.

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[1] It is only the recent presence among us of the kind and gentle old man, the apostle of syphilization, Prof. Boeck, of Christiania, which makes it necessary to devote more than a single line to syphilization. Certain desperate cases in a neighboring city were undertaken by him, and so decidedly benefited that a well-known surgeon of that city, in reporting the case, announced his faith in the so-called "duality of syphilis" shaken. But, granting any amount of improvement in any number of severe cases, although it might establish the value of continuous and prolonged cutaneous irritation as a means of combating severe forms of syphilitic disease, it could not establish the identity of the poisons of syphilis and chancroid, any more than could tartarization, employed with success, be held up as an argument for the identity of tartar-emetic and the syphilitic virus.

In a case (personal) of obstinate tuberculo-ulcerated syphilide, attended by acute ataxic symptoms in the lower extremities, where immense doses of iodide of potassium with a small amount of mercury failed to effect any marked or speedy relief, a certain advantage (by no means as marked as in Boeck's cases) seemed to be derived from the establishment and maintenance upon the breast of the patient of six large ulcers. They were kept open with the utmost difficulty, by means of large wooden buttons strapped down over them, and were occasionally sprinkled with tartarized antimony. The remedy caused pain, and the amount of benefit derived from it was not sufficient to justify its long continuance.

A few days of a mercurial treatment in some cases will disturb the regular development of symptoms, perhaps prevent their appearance altogether in a form which would be readily recognized, and, in face of such a case, if the diagnosis of the nature of the chancre had been doubtful, how much more so would be that of the subsequent syphilis! Hence the rule in all cases of doubt: Do nothing, but frankly tell the patient that he must wait; or, if he has not the grace to appreciate pure honesty, and must have something to do while waiting, give a placebo while studying the nature of the sore and awaiting developments. As soon, however, as the diagnosis "syphilis" is satisfactory, commence general treatment.

In the early manifestations of syphilis mercury is specially potent. Under its kindly influence the chancre heals, the early eruptions fade. If given continuously and intelligently from the first, syphilitic fever rarely amounts to more than a little pallor, with occasional osteocopic pain, and the early eruptions instead of being general are more or less discrete. The iodides have but little power over early syphilis, although they are sometimes preferred during syphilitic fever, especially if it run high. A mild mercurial, however, is better, but with it the tonic and hygienic treatment should be vigorously combined; and, if mercury have a depressing effect, it should be discontinued until the latter means have brought up the patient to a point where he can tolerate the more powerful drug. Mercury properly administered may be taken for years without any injury to the individual, or to his constitution, either immediate or remote. It has no connection as a cause with the appearance of severe tertiary forms of syphilis. Accumulating experience derived from more accurate observation has established this truth beyond cavil, although the ancient superstition as to the injurious after-effects of mercury still measurably taints popular belief.[1]

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[1] The sweeping assumptions and broad assertions of a recent author of a pretentious volume in folio ("Ueber die Wirkungen des Quecksilbers auf den menschlichen Organismus," Dr. Jos. Hermann), which would seem to ascribe all possible evils, and especially the symptoms of syphilis, to the effects of mercury, are too little substantiated by the facts adduced to call for any discussion here.

Bad Effects of Mercury.—Not very rarely a patient is found who cannot take mercury, or who bears it badly even in minute doses, and in any case it is a depressor of vitality if given too freely. Patients are now and then encountered, in all stages of syphilis, who are thrown at once into a condition of hopeless mental and emotional depression as soon as they begin to come under the influence of mercury. This curious phenomenon has been noticed again and again by the authors, and has been patiently and critically studied in order to differentiate it from the mental and emotional depressions caused by the syphilitic virus. Mercury will depress the spirits and give an otherwise buoyant disposition the most languid and distressingly desponding tendencies. No words can describe the awful gloom that settles down on an individual upon whom mercury exercises this peculiar power. One form of the remedy produces it as well as another; striking relief is afforded, obviously, by discontinuing the drug, or, what will often answer, lessening the dose. These symptoms may be observed before mercury has produced any effect upon the mouth or gums.

The other bad effects produced by mercury are salivation and diarrhœa with griping pain. The well-known poisonous effects of the stronger mercurials (bichloride, biniodide, bicyanide, etc.) render it unnecessary to discuss death from an overdose of one of the latter class. The general intelligence of modern practitioners renders it equally unnecessary to more than allude by name to mercurial tremor and mercurial cachexia, neither of which could occur except after an inordinate, unjustifiable use of the drug, although mild tremors are noticed sometimes after mercurial baths. (For the irritating effects of mercury used locally, *see* Inunction.)

Salivation.—Salivation is harmful. It should not be aimed at. The greatest effect that it is allowable to produce by mercury is to "touch the gums," as it is called. When the gums are touched there will be an increased flow of saliva, a faint coppery taste in the mouth, some tenderness of the gums, tongue, perhaps of the whole buccal cavity. Pressing the teeth firmly together causes slight pain, while a little swelling of the gums and a faint reddish line at the neck of the teeth may be noticeable. Sometimes ulceration along the edges of the tongue or gums, or on the inside the cheek, is caused by mercury, while there is still no tenderness about the mouth, nor a very markedly increased flow of saliva, but this is rare. The mouth should be inspected before commencing a mercurial course, so that the condition of the teeth and gums may be known. A patient with ragged teeth covered with tartar is not in a fair condition to test the therapeutic effect of mercury; his gums, naturally tender, will become affected long before his point of true tolerance is reached. It is, therefore, wise, in commencing a mercurial course, to send the patient to a dentist, with injunctions to have the tartar entirely removed from his teeth, both to make the observation of the effect of mercury more accurate, and to remove one source of local irritation capable of keeping up mucous patches. The quantity of the drug necessary to produce an effect upon the gums varies with each individual; minute doses will occasion it in some cases having special idiosyncrasies; others may take enormous doses before the symptoms yield or the gums become affected. The point of saturation or "tolerance" of a given patient can only be learned by close observation of the symptoms just described. After this we have his gauge, and can temper his treatment according to the urgency of his symptoms. Should salivation accidentally occur, or be encountered in practice, it requires treatment. The effect of mercury is by no means increased by keeping a patient salivated; on the contrary, the disease is not benefited, while the patient is positively injured.

The cause of salivation is special idiosyncrasy with a small dose of mercury, or no idiosyncrasy with large doses. A mouth kept dirty or containing bad teeth is more apt to suffer. The influence of cold and wet during a mercurial course seems sometimes (though very rarely) capable of inducing it. Bumstead[1] mentions a patient who became "profusely salivated a month after the cessation of a mercurial course as a consequence of exposure to the rain."

Symptoms.—In salivation the salivary fluids flow freely, sometimes to an enormous extent, the breath is fetid, the metallic taste is very marked, the gums are sore, perhaps bleeding, the teeth feel too long for the patient to shut his mouth, tapping lightly upon them causes pain, the tongue swells, showing marks of the teeth, the lips and cheeks may also become tumefied. Often there is febrile excitement with mental depression, the lymphatic glands in the vicinity become swollen and painful. The teeth may fall, or portions of the soft or bony parts necrose, in extreme cases. Articulation is indistinct and painful, deglutition almost impossible.

The above is a description of a severe type case of mercurial stomatitis. Between this and the mildest increase in the salivary flow with "touching of the gums," the affection assumes all shades and varieties of intensity. The patient should be cautioned to report for inspection on the advent of the earliest of these symptoms, that possibly impending salivation may be averted.

Treatment.—Salivation may often be kept off by the administration of large doses of the chlorate of potash during a mercurial course, and that, too, without interfering with the effects of the mercury, as Ricord has shown,[2] but it is better to hold this remedy in reserve for exhibition, in case symptoms of mercurialization should suddenly run high. During salivation, or any sore mouth from mercury, ten to twelve grains to the ounce, of chlorate of potash in water, or any bland fluid, should be kept constantly on hand (warmed), and with it the patient should repeatedly rinse his mouth and throat. At least one drachm, and not more than three, of the same remedy daily should be introduced into the patient's circulation, either through the stomach, if he can swallow, or by the rectum. A mild solution of carbolic acid or of Labarraque's solution, or water rendered pink with a little permanganate of potash, should be occasionally used as a gargle, where there is great fetor of the breath. These means will generally promptly overcome salivation. In all other respects the treatment of salivation is symptomatic. An anodyne or a laxative may be required—the physician selects the one with the use of which he is most familiar. Nourishment must be kept up by hot broths, milk, and soft articles of light food, until a subsidence of the swelling allows the patient to swallow solids.

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[1] *Op. cit.*, p. 502.

[2] "Leçons sur le Chancre."

Diarrhœa with griping pains is apt to come on in many patients who are fairly under the influence of mercury. If kept up, the patient loses appetite, runs down, and fails to derive benefit from his mercurial course. When any mercurial shows signs of disagreeing by the production of these symptoms, it is better to lower the dose, if the syphilitic lesions are under control; otherwise, to change the mercurial preparation for a milder one, putting the patient at the same time upon a rice-and-milk diet, with lime-water and moderate doses of bismuth, or to administer the mercury by some other method—inunction, fumigation. Opiates and astringents may be combined with the mercurial, to prevent its irritating effects, but it is better to avoid them if possible, or in any case to try first the means above suggested.

Methods of administering Mercury.—The effects of mercury are produced no matter how the drug is employed, hence the choice of a method depends mainly upon the ease of its administration, the promptitude of its action, or upon the desire to produce or to avoid some local, useful, or disagreeable effects. It is on this account that, for treating general[1] syphilis, the method by the stomach is the best. Since it is necessary to continue the use of mercury for a year, unremittingly, at the very least, it becomes at once apparent that the docility of the patient is taxed severely to keep him under treatment at all, and common-sense avers that the ordinary patient will take his medicine steadily by the mouth, in many cases where he would absolutely refuse to continue it by any other method—as by the hypodermic injection, inunction, fumigation. All of these methods have their value in the rapidity of their action, and from the fact that they spare the stomach, but, for prolonged, regular treatment, the latter organ must be relied upon. Even the advocates of other methods do not propose them for continuous use, but only to combat symptoms—calling the disappearance of an eruption a cure of syphilis, and the next eruption a relapse.

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[1] Frequent warm baths and the exhibition of diuretics are useful for patients under any mercurial course. They hasten the elimination of the drug, thus warding off evil effects, without interfering with the therapeutic action of the remedy.

Among the methods in common use for the administration of mercury at the present date, five require mention. They are, in the order of their respective value to the practitioner:

1. By the stomach.
2. Local.
3. Endermic (inunction).
4. Fumigation.
5. Hypodermic.

5. *Hypodermic Injections.*—In favor of this method it may be said that eruptions, iritis, and lesions relievable by mercury, seem to yield very rapidly during its employment, as a rule. The method employed is that of Lewin,[1] more or less modified. From one-sixteenth to one-eighth of a grain of sublimate, with perhaps a little morphine, dissolved in fifteen minims of water, is injected, once or twice daily, under the skin—preferably of the back below the scapula. The objections to the treatment are sufficient to condemn it, unless in exceptional cases, where a speedy action of the drug is required, or where the patient cannot or will not swallow. Abscess sometimes follows the puncture, and a hard, painful lump of chronic inflammation occupies the seat of the injection, as a rule, for a length of time. Salivation is not uncommon.

4. *Fumigation.*—This method is an excellent one, but not practicably applicable. It requires an expenditure of time and care, such as the ordinary patient will not continue to give it for a long time. It is useful where prompt and kindly action of mercury is aimed at. Improvement of symptoms sets in rapidly after the baths are commenced. Salivation is rarely induced. Fumigations may be taken daily, where the patient is robust and bears the treatment well, or at longer intervals. Depression, headache, faintness, tremors, occasionally salivation, or diarrhœa, attend this mode of treatment, when the patients are impressionable. Langston Parker[2] has done much to develop this form of treatment.[3]

The simplest method of thorough fumigation is the following: The apparatus for a local fumigation of the throat (Fig. 132) is all that is required in the way of special machinery. The patient undresses for retiring. The lamp and tin, and mercurial to be volatilized, are placed in position beneath a cane-bottomed chair. The patient, naked, sits upon the chair and wraps himself and the chair completely in a couple of thick blankets, drawing the latter snugly about his chin. A pan of steaming, boiling water is now placed under the blankets. As soon as the confined steam has rendered the body warm and slightly moist, the spirit-lamp under the chair is ignited. The bath lasts from fifteen minutes to half an hour. Profuse perspiration usually comes on. After fifteen minutes, if the patient is uncomfortable, the light may be extinguished, but remaining in the fumes five or ten minutes longer is of advantage. The patient now wraps one of the blankets around him and lies down, without wiping off the mercury until he has cooled. A more complete apparatus is that of Maury, of Philadelphia (Fig. 131). It is attached to the gas-burner by a rubber-pipe. There are two pans; one for water, one for mercury.

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[1] "Behandlung der Syphilis mit subcutaner sublimat-injection.

[2] "On Syphilitic Diseases," London.

[3] Mercurial fumigations are administered in most of the Turkish and Russian bathing establishments in all large cities; but it is the universal experience of physicians tha the proprietors of these establishments are prone to tamper with patients, and invariabl fail to carry out instructions received from the physician. Otherwise the facilities of such establishments of mingling steam with the fumes of mercury are unequaled. I these institutions, where the head is also immersed in the fumes, the black oxide is th most suitable mercurial to be employed—from one to two drachm doses.

Of the different mercurials generally used in fumigation, calomel is the best. About a scruple is enough for a bath; the diminution or increase of this dose is regulated by circumstances. Calomel is better than the other substances used, because it volatilizes promptly with a heat easily attained by a spirit-lamp, and whatever of the fumes escapes into the room is not irritating to the fauces. The red oxide of mercury also volatilizes without reduction. All the other substances in common use, metallic mercury, mercury with chalk, the gray oxide, the black oxide, the binoxide, the yellow oxide, the bisulphuret, are exactly the same thing; they all reduce first, and then the metallic mercury volatilizes.

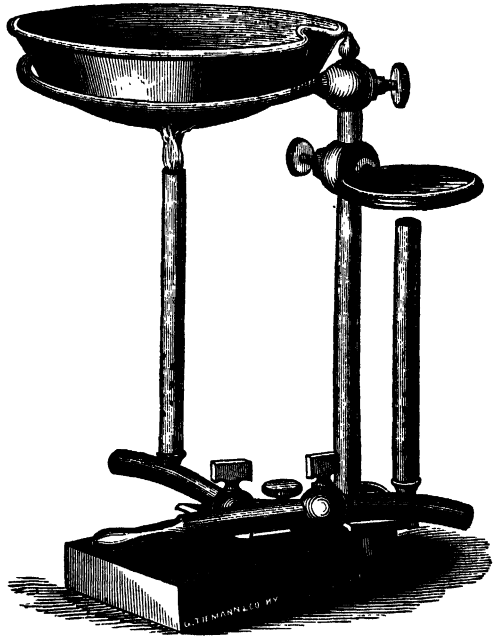

FIG. 131.

Pure metallic mercury boils at 662°, and is apt to sputter on the application of dry heat before it volatilizes. It takes considerable heat to vaporize it. When the red sulphuret of mercury is employed, the fumes are those of sulphurous acid and metallic mercury; the former is often irritating to the pharynx and lungs, and the preparation should not be used without circumspection.

3. *Inunction.*—Sigmund, of Vienna, is the present apostle of the "inunction cure of syphilis," a method of very ancient origin. Inunction is, perhaps, of all, the best means of exhibiting mercury. It spares the stomach, and rarely salivates, and though, in special cases, it may produce any of the bad effects of mercury, yet it is, undoubtedly, of all methods the least apt to do so. The only objections to its continued use are that it requires time and care for its proper application, is not cleanly, and may give rise to a local eczema.

Should this eruption occur, it is treated with soothing ointments. The best preparations to use in inunction are the oleates of mercury. They are found in the shops of three strengths, five, ten, and twenty (sometimes thirty) per cent. of the peroxide of mercury, combined (chemically) with oleic acid. They are rather expensive. The five-per-cent. preparation resembles linseed-oil; the twenty-per-cent. is thick, pasty, yellowish. The disagreeable odor may be corrected by the addition of a few drops of oil of roses. The twenty-per-cent. preparation is actually eighteen and a half per cent., a little more than one-third the strength of strong mercurial ointment, which contains fifty per cent. of mercury—the others in proportion. Twenty-per-cent. oleate irritates the skin, but not as much as mercurial ointment. It is more cleanly, and seemingly capable of much more thorough and rapid absorption. The five-per-cent. oleate may be rubbed daily upon the same portion of integument in many individuals without producing the least irritation. Choosing one of these preparations, according to the irritability of the skin and the effect desired, preferably the twenty-per-cent., the patient with his own fingers rubs it gently into any convenient portion of the skin until the proper dose has been used, and it has mostly sunken into the integument. The scrotum is to be avoided, and a different portion of integument chosen each night. Absorption is most rapid through the soft skin of the flexures of the joints. After the friction has been made, the part is covered with a bandage, to preserve the clothes, for twenty-four hours, when the spot is washed with soap and warm water, and a new inunction is made elsewhere. The dose for an inunction of the twenty-per-cent. oleate is about ʒ j, of the others, proportionately more. Mercurial ointment—more dirty, less effective, less expensive—may be used in the same way, at a dose of ʒ ß-j at a friction.

Another excellent endermic method[1] of giving mercury is, to spread out upon a fold of thick bandage mercurial ointment, or better, twenty-per-cent. oleate over a space about as large as the palm, and to bind this around the arm, forearm, leg, thigh, body, in succession, keeping the mercury against the thinnest portions of the skin. Such a bandage may be worn twenty-four, forty-eight hours, in some cases indefinitely, for weeks without washing the spot. It should be studiously inspected, however, and removed at once on the advent of itching or the appearance of any erythema. When it is removed, the surface should be washed with soap and warm water.

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[1] Known as Teale's method.

2. *Local Use of Mercury.*—This will be referred to in connection with the different lesions. The local application of mercury alone, or (in ulcerated lesions) in combination or alternating with iodoform, has a positive beneficial (local) influence. Powders, solutions, oleates, ointments, all have their merits.

1. *Mercury by the Stomach.*—This means must be adopted in the vast majority of cases, and it is only in examples of rare idiosyncrasy that it is objectionable. As already stated, the general action of mercury taken by the stomach is not so rapid as by other means. It may, however, be so taken for any length of time, is very little troublesome, can be continued while traveling, and without making the patient conspicuous to his friends.

Several forms of mercury have proved themselves by experience to be especially adapted to prolonged use by the stomach in syphilis; they are the protiodide, the bichloride, blue-pill, and gray powder; the latter has been used chiefly with infants. Calomel is useful in those cases where it is desirable to bring the patient very rapidly under the full influence of mercury. Administered in one-twelfth-grain doses every hour, it will often "touch the gums" in twenty-four to forty-eight hours, and with safety, for its prompt discontinuance on the first appearance of signs of salivation prevents the development of the latter. These preparations leave little to desire. The gray powder is least irritating to the stomach, blue-pill next, then protiodide, and most acrid the bichloride. Their power over the disease is, however, not at all dependent on their irritating properties, and, though this or that susceptibility or irritability may render the choice of this or that preparation advisable, yet for the great majority the protiodide is the best. It is well borne by most stomachs, and is sufficiently powerful. The American protiodide is of irregular strength, and very apt to be highly irritating when used in effective doses. The best preparation known is the imported one (French), preferably as found put up in sugar-coated granules, one-fifth grain each, by Garnier and Lamoureux. In using this preparation it is best to commence with one granule after each meal (three daily), and to add one granule every third or fourth day to the daily dose (not to each dose), until either the metallic taste is complained of, or some slight intestinal irritation is felt, or until three granules can be taken at a dose. It is rare to find a patient who will support more than three. On the advent of any irritation at the mouth, or in the intestine, the dose is to be slightly decreased. When the proper dose is reached (two or three granules), it is steadily maintained. If the mercurial course has been begun early, no eruption may appear, or only a few scattered papules, some glandular engorgement, and a few mucous patches which will rarely escape an attentive observation, somewhere between the second and the sixth month.

Should a more positive outbreak appear at any time during the mercurial course, instead of increasing the dose by the stomach, it is better to resort to inunction or fumigation, in addition to, or in place of, the regular treatment, until the eruption disappears, and then to continue steadily with the granules of the protiodide without intermission for at the very least one year. Instead of employing inunction, if the stomach be powerful, on any given outcrop of eruption the bichloride may be substituted for the granules at a dose beginning at one-twentieth of a grain, in a bitter menstruum, increasing until the symptoms yield, or some disagreeable result of mercurialization seems imminent, carrying the dose to one-eighth or one-sixth of a grain.[1] The common solution in tincture of bark (or the elixir) is as good as any that can be desired:

℞. Hydrarg. bichlorid.,
Ammonii sesquichlorid., āā gr. jss–iij.
Tr. cinchonæ co., ℥ iij.
M. S. Teaspoonful, largely diluted in water, after eating,

Or the old New York Hospital formula—

℞. Hydrarg. bichlorid., gr. iv.
Tr. ferri sesquichlorid., ℥ j.
S. Ten drops in water after eating—

may be exhibited with good effect in anæmic cases where the stomach is not weak, as in the earlier outbreaks attended by syphilitic fever, where a tonic is particularly required—in some cases indeed to the total exclusion of mercury. When it is deemed advisable to give the bichloride in pill-form, it may be combined with reduced iron, as in the following:

℞. Hydrarg. bichlorid., gr. j.
Ferri redact., ʒ jss.
Gum. tragacanth., } q. s.
Glycerini, }
M. F. pil., No. xv.

In anæmic women the New York Hospital formula is a good one, in which blue-pill gr. ij is combined with gr. j of the dried sulphate of iron in pill-form. The quantity of either ingredient of the pill may be increased if circumstances require. Finally, the gray powder (hydrarg.

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[1] Muriate of ammonia is frequently added to solutions containing the bichloride, to increase the solubility of the latter, where large doses are given. A saturated solution of hydrochlorate of ammonia dissolves seventeen times more bichloride than simple water.

cum cretâ) may be employed, increasing from two-grain doses. It is very mild in its action.

TREATMENT OF LATE SYPHILIS.

This includes the use of the iodide of potassium. The iodides are rarely of value in the early stages of the disease. They are often given instead of mercury during syphilitic fever, but their action is probably purely tonic, and not at all specific in such cases, since their administration does not have any appreciable effect over the duration of the early syphilitic exanthemata. The iodides are useful early in cases of precocious syphilis, where lesions of bone, nervous manifestations, or deep ulcers, come on shortly after chancre.

As soon, however, as the cutaneous lesions of syphilis show a marked tendency to aggregate into patches, and especially to remain long chronic, as scaly or tubercular thickened patches, or, indeed, without eruption, after the first year of treatment, the iodide should be used with mercury in the form of treatment called mixed. Again, all lesions certainly or presumedly gummy, ulcers, gummy tumors, deep lesions of bone, of brain, of viscera, require the iodide in large excess, often without the addition of mercury, until the symptom is controlled, then again in combination and in reduced dose.

Mixed Treatment.—There are many methods of employing the mixed treatment, of which but three require mention:

1. When the two drugs are mixed in the same prescription.

2. When they are given separately at the same or different hours of the day.

3. When the iodide internally is combined with inunction.

1. *Mixing the two drugs in the same prescription* is the best method for prolonged use. Either ingredient of the prescription may be raised or lowered according to the requirements of the case. The following "syrup of the biniodide" is at once palatable and efficient. Ammonia in some form is generally added to prescriptions containing the iodides, under the idea that it improves and intensifies their action.

℞.	Hydrarg. biniod.,	gr. jss.
	Ammonii iodid.,	ʒj.
	Potass. iodid.,	ʒij.
	Syr. aurant. cort.,	℥j.
	Tr. ejusdem,	ʒj.
	Aquæ,	ad. ℥iij.

M. S. Teaspoonful, largely diluted with water, after eating.

The iodide of sodium may be substituted for the iodide of potassium, and the sesquichloride for the iodide of ammonium, in the above, and the dose increased according to the requirements of the case. A prescription in common use and based on high authority, wherein the bichloride of mercury is given with iodide of potassium in solution, although undoubtedly effective, is unchemical, and no better than a fresh combination of the biniodide with the iodide of potassium. The bichloride in contact with the iodide of potassium is decomposed and becomes biniodide.

The mixed treatment may be carried out in pill-form, where only small doses of the iodide are required. Where the dose is large, solutions should invariably be used. Ordinary pills containing iodide of potassium are difficult to keep, on account of tendency to deliquesce. They may be kept, however, in bottles with tight rubber stoppers. A pill containing five grains of the iodide with one-sixteenth of a grain of the biniodide is not inconveniently large. Such pills should be taken during, or immediately after, a meal.

For convenience of administration, where only small doses are required, Dunton has prepared three sets of "compressed pills," which keep perfectly well, and form an elegant preparation. They contain simply the biniodide of mercury with the iodide of potassium, in the proportion of one-twentieth of a grain to three grains, one-sixteenth of a grain to four grains, one-twelfth of a grain to five grains.

2. *Where the drugs are given separately* the iodide is administered in water or in syrup, the mercury in pill, syrup, in any of its forms, at a suitable dose. Usually a mercurial pill is taken once or twice daily, and a solution of the iodide given at separate hours. This plan presents no advantages, and is more troublesome than the ordinary mixed treatment.

3. *Iodide internally combined with inunction* (or even fumigation) is an excellent method of treatment, especially in old, chronic, inveterate cases, where the stomach must be spared as much as possible for food, but where the mild, efficient action of mercury seems to be required.

Treatment by the Iodides.—The more purely gummy any lesion, the more certainly will it yield to the iodides. Hence, these preparations are particularly suited to the treatment of the late manifestations of syphilis. No agent in medicine is more brilliantly effective than the iodide of potassium, promptly and unsparingly used, in cases of rapid, destructive, gummy ulceration, as of the throat, nose, skin, or in sudden, violent attacks of nervous syphilis. Unfortunately, however, the iodides do not seem to have very marked curative virtues, gummy deposit often melts like snow under their use, but other symptoms appear after a time. Hence, however strong a weapon the iodides may be, mercury is more powerful in ultimately controlling the disease, and we are accustomed to resort to it in late cases, as well as early, to exercise a curative action, by keeping off subsequent so-called relapses.

THE BAD EFFECTS OF THE IODIDES are four, and are most apt to appear when the diuretic action of the drug is absent or deficient. The kidneys would seem to be the natural channels for elimination of the iodide; when it is retained, iodism results; when it attempts to escape by the skin or mucous expansions, unpleasant symptoms are more apt to accompany its administration.[1] The bad effects of the iodides are:

1. Possible indirect causation of salivation.
2. Iodism.
3. Irritation of mucous membranes.
4. Cutaneous eruptions.

1. *Salivation.*—Indirectly the iodide of potassium may cause salivation, since it dissolves and renders active mercury which may be lying dormant in the tissues, causing its elimination. Hence, some care is necessary in commencing a course of iodide of potassium after a course of mercury, especially where the patient is known to be sensitive to the action of the latter drug. Indeed, the efficient action of the iodide over late symptoms has been ascribed to its power of liberating, rendering active, mercury already in the body. This position is unsound, since cases of tertiary disease, which have never been treated by mercury, yield promptly to the iodide. Bumstead quotes a striking case.[2] In this country we rarely encounter patients with syphilis who have not taken mercury.

2. *Iodism.*—A peculiar poisonous effect is produced upon some patients by the use of iodine, especially in the form of iodides.[3] The symptoms are general irritation of the nerves, with depression; the ears ring, the head aches, neuralgic pains are felt deep in the bones and muscles. There is more or less general torpor, with physical and mental depression. This affection is rare. It may occur from the least touch of iodine, or large quantities may be required to produce it. It occurs with or without irritation of the cutaneous or mucous expansions.

3. *General irritation of more or less of the mucous expansions* of the body, with perhaps some nervous phenomena, headache, pains in the bones (iodism). In mild cases this takes the form of "catarrh," or a simple cold. A sharp coryza sets in, with sneezing and a plentiful watery discharge from the nose, perhaps with reddened conjunctivæ and streaming eyes. Bumstead mentions, in rare instances, loss of vision, due apparently to sub-retinal effusion. The lining of the frontal sinuses may be hyperæmic and swollen, occasioning considerable pain. The fauces and mucous lining of the lungs participate in these hyperæmic and secretory changes occasionally. The symptoms sometimes reach a high grade, from swelling and œdema. A marked increase of the salivary flow is observed.

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[1] The supposed power of iodine, long administered, to cause atrophy of the testicles (the breast in the female), and abolish sexual vigor, is purely hypothetical. Temporary diminution of sexual appetite seems occasionally to depend upon the internal use of iodine, but the abolition of the power, or atrophy of the testicle, never—although syphilis may undoubtedly cause both the latter.

[2] From *Gazette des Hôpitaux*, January 28, 1860.

[3] One physician in this city stated to me that the least contact even of tincture of iodine with the skin gave him symptoms of iodism. Another physician was at one time always disagreeably affected in a nervous way by touching his tongue to any solution containing the iodide of potassium.—KEYES.

The stomach and intestines suffer less often than the nasal and bronchial membranes, if the precautions are observed of never giving the iodides solid, except in small quantity, during or immediately after a full meal. When a large quantity is given, it must always be in solution largely diluted, and taken upon a full stomach if possible. A neglect of these precautions not infrequently produces pain in the pit of the stomach, loss of appetite, griping, diarrhœa. Mild attacks usually subside even with a judicious continuance of the remedy. But in rare cases the symptoms are so violent that the drug has to be discontinued.

The iodide of sodium is much less irritating to the stomach and intestines than the iodide of potassium. Its effects upon the skin seem also to be less marked; but, on the other hand, its therapeutic action does not appear to be as prompt or effective. This irritation of the membranes, when not subsiding rapidly enough upon suspension of the remedy, may be hastened away by diuretics and diaphoretics.

4. *Eruptions caused by the Iodides.*—Three forms of eruption are encountered upon patients taking the iodides and produced by the drug. In patients where the elimination by the kidney is rapid and thorough, generally neither iodism nor any eruption is encountered. The eruptions are, in the order of their relative frequence: acne, erythema—more or less modified—purpura.

1. *Acne.*—A few pustules or papulo-pustules of acne (simplex or indurata) generally appear during a course of the iodides. Their favorite site is about the forehead, cheeks, shoulders, back, buttocks, and extensor aspect of the limbs. They are usually unimportant, but sometimes they occur in profuse crops, covering nearly the whole body, and are then painful and unsightly. With acne may be associated large tuberculo-pustules and boils.

2. *Erythema.*—Iodic erythema, as commonly observed, covers the slopes of the nose and portions of the cheeks and forehead. It is followed by branny desquamation. It may occur upon other surfaces, isolated or in large patches, particularly on the forearms. It is sometimes attended by papulation. Papules may appear, not acneic and not surrounded by erythema. The erythema may run on to eczema about the face and scalp. Mercier[1] mentions a case where in the same patient, on two occasions, small doses of the iodide of potassium produced a severe eruption of eczema rubrum over the whole body. Another form of vesico-pustular (bullous) eruption occurs, but is exceedingly rare.[2] It is very severe. Slight erythema usually precedes the development, all over the body, of patches, more or less large, of bullæ, some of them umbilicated, of the size of a split-pea to nearly that of a penny. They quickly become purulent. They are accompanied by burning pain and

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[1] Quoted by Bumstead, from *L'Union Médicale*, February 11, 1860.

[2] The authors have encountered one very striking case.

itching, and disappear rapidly upon discontinuing the iodide, to reappear if the drug is again exhibited.

3. *Purpura* may be caused by large, sometimes by moderate doses of the iodides; chiefly in debilitated, anæmic subjects, suffering from syphilitic cachexia and tertiary lesions. Case L. illustrates this point, where the patient was surrounded with every comfort, eating vegetables, not overworked, or seemingly in any way scorbutic. The best-marked cases of purpura hæmorrhagica, in the authors' experience, are encountered in connection with advanced tertiary disease, as in giving large doses of iodide for nervous syphilis. Iodic purpura rarely gets above the knees. It is accompanied by some œdema. It may occasionally reach the thighs, or be seen upon the hands. It often ceases to appear upon discontinuing the drug, or change of air. The exhibition of cod-liver oil, astringent preparations of iron, and other hygienic and tonic measures, are indicated. All of the bad results of iodine disappear when the drug is discontinued. The acne and erythema may be moderated by plentiful warm baths and a diuretic (half-drachm doses of acetate of potash), which hasten elimination somewhat and prevent bad effects, without interfering with therapeutic action.

Method of administering Iodine in Syphilis.—Only certain iodides, of those in general use, are valuable as controlling syphilitic manifestations. These are, the iodides of potassium, sodium, ammonium. The first is preferable, if it can be borne, the iodide of sodium is milder, the iodide of ammonium is more difficult to take, and is rarely used alone. It may be conveniently combined with the iodide of potassium, the action of which seems to be increased by any ammoniacal preparation; of which the favorites are the muriate and the carbonate. In selecting an iodide, the preparation of sodium should be commenced with where the *primæ viæ* are in an irritable condition. Inflammation of these organs contraindicates the use of iodides.[1]

The iodine may be given pure in small doses. Dunton's compressed pills of iodide of potassium, containing gr. v each, may be used if taken with or immediately after food. Not more than gr. v of solid iodide should be taken at a single dose, for fear of irritating the stomach. When given alone, the iodides are best combined with tincture of bark or of gentian.

℞.	Potass. iodidi,	ʒ ij.
	Ammonii iodidi,	ʒ j.
	Tr. cinchonæ co.,	℥ iij.

M. S. Teaspoonful, largely diluted with water, after eating.

When a considerable quantity has to be taken for a long time, it is best to order the concentrated solution :

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[1] In certain cases, where it has been impossible to administer iodides by the stomach, the authors have obtained excellent effects by using them in the rectum. As much as half-drachm doses daily have been given dissolved in an ounce or more of beef-tea. The stomach is spared in this way for food, but usually the rectum revolts after a time, especially if the solution of the iodine be too concentrated.

℞. Potass. iodid.,
Aquæ, āā q. s.

Commencing at five drops, largely diluted, after eating, go on until the symptoms yield, or the remedy disagrees.

Quantity of Iodide which may be required.—There is practically no limit to the proper dose of the iodide of potassium, except an improvement of the symptoms. A taste may produce iodism in some cases, in others the symptoms fail to yield until enormous doses have been reached. An old patient, whose mouth, fauces, and nose, formed one vast, ulcerated cavity, a hospital case, who was accustomed to enter the Charity Hospital, stay till he was nearly well, and then leave until the progress of his disease forced him back—this man took daily for eleven days, having been rapidly run up to this amount, two ounces (nine hundred and sixty grains) in the twenty-four hours. He developed only a few scattered pustules of acne, but, after eleven days, when the destructive disease in the throat had been stayed, the stomach began to suffer, and the dose was decreased. His throat went on improving under the diminished dose. It is not uncommon to see patients, with open, advancing ulceration, who have been taking perhaps twenty-grain doses of iodide of potassium for weeks without benefit, in whom another five or ten grains added to the dose clears the ulcer, arrests its progress, and induces rapid cicatrization. Hence the rule: in all cases where the diagnosis is certain, of a late, tertiary, syphilitic symptom requiring iodide of potassium, continue increasing the dose until the symptom yields, or the patient will bear no more. The advantage of hygiene in connection with the administration of the iodides is illustrated by Case L.

DURATION OF TREATMENT.

Treatment of syphilis, according to the experience of the authors, should last at the very least two years—one year with mercurials, one year with mixed treatment—and this in cases which show only the mild lesions of glandular engorgement, a few papules or roseolar patches, mucous and scaly patches in the mouth, and sore-throat. To this class belong nearly all cases treated steadily and conscientiously, continuously from the first. It is the rare exception to find such patients showing bad symptoms during their treatment, or developing serious lesions afterward. In other words, those cases do badly most often which are irregularly and spasmodically treated, and those cases are most apt to be prolonged and obstinate, and indeed to crop out in severe lesions at late date after chancre, which have not followed a continuous, persistent, prolonged, mild mercurial course at the start.

Hence there are two classes of cases to be discussed:

1. The patient who comes with syphilitic chancre.
2. The patient who comes with a late, obstinate form of disease, after perhaps years of apparent health.

1. *The patient who comes with chancre* should be gently urged with a suitable mercurial, until his "dose" is found. His "course" should now be based upon a dose a little lower than this, which should be continued steadily, until some reason to change appears. Should an eruption crop out, the remedy is changed and slightly pushed and maintained steadily, inunction being added, until the eruption has disappeared. Tonic and hygienic measures are observed throughout. In bad cases, with frequent outcrops, this mercurial course may be prolonged eighteen months, twelve may be sufficient. Where tertiary symptoms appear early, the iodide of potassium must be added to the mercurial.

After this, mixed treatment is commenced, and is to be continued one year, eighteen months, or more, until at least six months have passed after the appearance of any symptom due to syphilis. Then the patient should be put for a while upon a tonic, and finally allowed to give up treatment.

This is the treatment by extinction, and although it is impossible to say of any given patient that he will never have a relapse after having faithfully followed it, still it is so rare as to be almost phenomenal, when a case so treated develops any very serious lesions due to syphilis, later on in life. What symptoms do appear, if any, generally yield promptly to the mixed treatment, while it is rare for extensive, pure, gummy lesions to develop.

2. *Where the patient first comes for treatment with serious or obstinate disease which has come on at a late period after chancre*, there will be found to blame, either: 1. The gouty constitution. 2. The scrofulous diathesis. 3. Intemperance, excess, or misery—in short, bad hygiene; or, 4. A short mercurial treatment, at first, perhaps, carried to salivation, which, in the treatment by extinction, is always to be avoided.

The proper course to pursue with such a case is to adopt a treatment suited to the lesion, mixed or iodide alone, and to use it, aided by hygiene, until the lesion has disappeared, then to commence a course of mixed treatment, and continue it mildly for a year or more, watching for relapse; finally, to terminate with a mild, pure mercurial course, extending over six months or a year at least. This seems to be the most beneficial course, but in old, obstinate cases it will not always prevent subsequent outbreaks. In such cases the main reliance is in tonics, hygiene, and the symptomatic treatment of the outbreaks. It must be remembered that mercury has power, more or less marked, over all shades and dates of syphilis. It is useful in the tertiary stage, although undoubtedly not so useful as in the secondary.

CHAPTER VI.

SYPHILIS OF SKIN AND MUCOUS MEMBRANES.

Syphilides, Secondary and Tertiary.—The Secondary Syphilides.—Concomitant Symptoms on Mucous Membranes.

The Syphilides are those manifestations of general syphilis found upon the cutaneous envelope. There are two groups, the secondary and the tertiary.

Those occurring in secondary syphilis are:

1. Roseola;
2. Papular syphilide;
3. General pustular syphilide;
4. Pigmentary syphilide;
5. Bullous syphilide;
6. Vesicular syphilide;
7. Squamous syphilide;
8. Tubercular syphilide.

With these occur on the mucous membranes:

1. Erythematous patches;
2. Ulcers;
3. Mucous patches;
4. Scaly patches.

These are all general eruptions, except the pigmentary and scaly syphilides, and they belong to the group called secondary, about in the order in which they are given. Thus the roseola and papular syphilide always appear early; the tubercular and scaly syphilide always late. The former require mercury alone for their removal; the latter demand a mixed treatment, a combination of the iodide of potassium with mercury, to insure the most prompt and effective action.

The syphilides which belong to the tertiary stage of the disease are:

1. Ecthyma;
2. Rupia;
3. Groups of pustules;
4. Tertiary ulcerations;
5. Gummy tumor.

With these occur on the mucous membranes:

1. Mucous patches;
2. Scaly patches;
3. Deep chronic ulcers;
4. Destructive gummy ulcerations.

These (tertiary) affections, it will be noticed, are none of them generalized. They all occur in patches. They will be considered later. The concomitant symptoms of the group are affections of the bones, of the larynx, of the internal organs, and nervous syphilis.

SECONDARY SYPHILIDES.

1. Roseola.—This is an erythema, or simple redness, occurring in small, flat patches or blotches of irregularly crescentic or circular form

and slightly indented margins, each blotch varying from the size of a split-pea to that of a copper penny. Occasionally the blotches become confluent. Instead of being flat, the patches of eruptions may be raised above the level of the surrounding skin by the presence of minute papillæ upon the reddened area. The patches of roseola resemble exactly what would be an exaggeration of the mottling (marbling) of the integument, which any fair-skinned individual may observe faintly upon his own person by exposing the abdomen to cold air for a few moments. This erythema is the lesion proper, but, following the rule of polymorphism in syphilitic eruptions, it is customary to find other lesions besides the erythema, such as pustules leaving scabs in the hair, and pustules and papules elsewhere, scattered through the eruption, especially about the head and face. The patches of erythema at first disappear entirely upon pressure; but, where the eruption has been intense or of long duration, a faint, tawny, yellowish-brown stain is left after pressure (pigmentation), which indeed outlasts the eruption and is removed only by time. A small amount of fine desquamation attends the disappearance of the eruption in well-marked cases.

This exanthem is usually the first to appear after chancre, generally at about six weeks, sometimes three weeks, occasionally after several months, but rarely after the fourth. Its advent usually coincides with the secondary engorgement of the lymphatic glands. It often comes on slowly, and may never be observed by the patient until his attention is attracted to it by his physician, or it may be called out rapidly by the heat of a bath, by a cold, or other exciting cause. If the patient have had no syphilitic fever, he is less likely to have noticed the eruption. When it comes on slowly, the chest and flanks are first invaded, and an inspection of these surfaces with the light shining obliquely across them will reveal sometimes the beginnings of a roseola, as yet invisible to casual inspection. In rapid cases twenty-four hours are sufficient to cover the whole body with the eruption, including even a few blotches on the palms and soles. In perhaps the majority of cases the eruption is confined to those portions of the skin covered by clothing, the hands and face escaping, or being so faintly marked as not to attract attention.

When roseola comes on early, it lasts from one to six weeks; when, however, it first appears some months after chancre, it usually lasts several months. Treatment greatly influences its duration. Relapse occasionally occurs.

Diagnosis.—Patients with syphilophobia are apt to mistake the natural marbling of the skin produced by cold for syphilitic roseola. Heat causes this marbling to disappear. Non-specific roseola is attended by some positive febrile symptoms, often by nausea, disappearing when the eruption comes out. The latter runs a rapid course. It is more frankly inflammatory than the syphilitic roseola, and occurs chiefly in children. Copaibal roseola is frankly inflammatory, usually itches, sometimes excessively. The history shows the ingestion of copaiba (of which the urine smells), and abstinence from the balsam effects a speedy cure. Urticaria occurs in raised patches, and itches greatly. The concomitant symptoms distinguish measles. The non-inflammatory character of syphilitic roseola, its lack of itching, and the accompanying indolent engorgement of the lymphatic glands, render its diagnosis easy. When itching is complained of with syphilitic roseola, pediculi, urticaria, or some accidental eruptions are to be suspected. (*See* Case XLIX.)

General treatment alone is required.

2. PAPULAR SYPHILIDE.—This eruption may follow a roseola, or a roseola may be transformed into a papular eruption, or the latter may be the first eruptive outbreak observed after chancre. The papules constituting the initial lesion may be miliary in form (like those seen on the spots of roseola), in which case they are often early surmounted by a minute vesicle. The papule is often larger, but acuminated, or it may be broad and flattened (this is a common form), about the size and shape of a split-pea (lenticular); or, finally, this last form of papule is sometimes greatly exaggerated, reaching the size of a penny. The type varieties, then, of papule in the earlier general papular syphilide are two, the acuminated and the flat. The general characteristics of the eruption are the same in each. The papular syphilide is superficial and precocious.

The color at first is rosy, but soon darkens to the purplish hue of syphilis. Pressure removes the color at first, but later some pigmentation occurs, and then pressure is no longer effective. This final tawny coloration often outlasts all prominence of the papule. Desquamation sets in early. Fine scales become detached, especially around the base of each papule, forming a sort of little ruffled border of white. Biett considered this circular desquamation of the base of the papule of great diagnostic value. It occurs, however, occasionally, in the case of large non-syphilitic papules. Sometimes the desquamation is so considerable over closely-grouped broad papules, that a diagnosis with squamous syphilide becomes difficult. One form of papular syphilide is peculiar: Broad flat papules appear, scattered irregularly, especially seen about the face, forehead, and neck, and on the scalp. Each papule is covered by a thin, yellowish, superficial scale, like a scab, raised at the borders, and distinctly depressed centrally. The raised edge is sometimes distended by a slight amount of serum, the whole looking like a flattened, partly-desiccated bulla. Sometimes each lesion is surrounded by a reddened (livid) areola. Shortly the large superficial scale becomes detached, the papule pales, flattens, disappears, and leaves no scar.

The papular syphilide, though general, is usually most marked at the back of the neck, on the forehead, back, and flanks. There is no pain or itching with this eruption. Scabs in the hair are likely to coincide with it, and the indolent, engorged, post-cervical and epitrochlear ganglions are rarely absent. The eruption may come before the third week from chancre, or after the fourth month. Its duration is from three to eight weeks, it may be prolonged for months by the recurrence of successive crops of papules.

Diagnosis.—A papular syphilide is liable to be confounded with two eruptions only. (1.) When the acuminated papules are few, and scattered about the temples, and over the forehead, they greatly resemble a form of acne seen in middle age upon rheumatic subjects. The syphilitic eruption may be usually distinguished by a certain amount of pigmentation around the older papules, a feature not observed in acne. (2.) The flat papules, few in number, livid in color, and attended by no itching, situated over the backs of the hands, wrists, forearms, and sometimes extensively over the body, and constituting one of the forms of lichen planus seen on rheumatic subjects, are very liable to be mistaken for syphilitic lesions. The patches, however, are more irregular in shape and size, and often present a slight umbilication (without desquamation) at some period of their course, which, together with the history and lack of concomitant phenomena, serves to distinguish this affection from a syphilide. With the papular syphilide are apt to coexist scabs in the hair, engorged ganglia, perhaps patches of erythema and pustules occasionally, and pretty certainly mucous patches, erythema or ulceration of some mucous membrane, especially that of the fauces. Small, circular reddened spots on the palms and soles are also a very constant accompaniment of a generalized papular syphilide. These are attempts at papulation aborted by the thickened epithelium. They appear as circular depressions, reddened centrally and partly deprived of epithelium, which latter is undermined at the edge of each depression as a whitened, fringed circle. Several of them may usually be found on each palm. An exactly similar condition is sometimes seen on the palm after an attack of lichen urticatus of the extremities. The severe itching attending the latter eruption insures against error of diagnosis. This affection of the palms is sometimes described as syphilitic psoriasis. It is more justly an aborted papular syphilide, or results from previous small patches of erythema. It may be found when there is no other syphilitic eruption upon the surface. Its appearance is characteristic, almost pathognomonic of syphilis. Iritis sometimes accompanies a severe outbreak of syphilitic papules.

Treatment.—A general papular eruption requires only general treatment. When the papules are conspicuous upon the face or hands, their disappearance may often be greatly hastened by local applications Any mercurial ointment is useful, rubbed into the papules. Ungt. hydrarg., red oxide of mercury ointment, and dilute citrine-ointment (ʒ j–ij to the ℥ j), are all efficacious, but the most prompt results are obtained from one of the following:

℞.	Hydrarg. ammoniat.,	ʒ ss.–ʒ j.
M.	Cerat. benzoat.,	℥ j.

Or—

℞.	Hydrarg. oxid. flav.,	gr. xx to ʒ j.
M.	Cerat. benzoat.,	℥ j.

and perhaps best of all the five-per-cent. oleate of mercury applied nightly. The white ointment, on account of its color, may be used for the face, the yellow for the palms—the oleate for either.

These local mercurial applications are useful in all the dry syphilides, and (mitigated) in the ulcerated forms of disease as well.

3. GENERAL PUSTULAR SYPHILIDE.—There are three varieties of generalized pustular syphilide belonging to secondary syphilis:

(*a.*) Superficial pustules complicating other lesions.

(*b.*) General syphilitic acne.

(*c.*) Superficial ecthyma.

(*a.*) *Superficial Pustular Syphilide.*—With a roseola, or papular syphilide, or occurring alone, there may be some superficial pustules scattered on the scalp, or along the forehead, or about the upper lip, at the base of the nose, at the labial commissures, or, indifferently, over any part of the body, more or less thickly. The pustules are small, superficial, ephemeral, without any hardened or elevated base; they often run together and dry up, forming scabs—brown, rough, uneven—like those seen in impetigo. The patches always tend toward a circular arrangement. Instead of drying up under the scabs, slight ulceration may take place, with, not infrequently, vegetation of the surface by the excessive growth of granular tissue. This feature is especially noticeable at the angles of the lips, or around the base of the alæ of the nose. Indeed, any moist, ulcerated surface may granulate, the feature being an epi-phenomenon, and not essentially a characteristic of syphilis. Occasionally, in syphilis about the labio-nasal furrows, the lips, and chin, minute, dry, irregular, papular prominences occur in rows and segments of circles where there has been no previous moist surface. These warty excrescences rarely get larger than the head of a pin; they are of a dead gray color, sometimes pigmented. They last several weeks, then dry up and disappear without leaving any cicatrix. Hardy has described the eruption as "syphilide granuleuse."

There is nothing about the slight pustular eruption above described characteristic of syphilis, except the pigmentation of the skin in th brown areola which forms about the scabs, and the tawny, vinous-red color of the skin left after the fall of the latter. A very faint, central depression marks the spot of the pustule, and from this central depression the clearing up of the pigmentation begins, progressing centrifugally. The eruption may relapse, several crops appearing successively, especially on the scalp.

(*b.*) *General Syphilitic Acne.*—This eruption occurs scattered over the scalp, face, and the extremities, the lower rather than the upper, or it may cover the whole body. Each pustule is distinct, and out of most of them grows a hair. They are not prominent, usually small, often but little larger than a grain of millet, occasionally quite large. Each separate pustule rests on a reddened base, which itself never suppurates, the pustule being superficial. Each pustule grows slowly, taking from two to three weeks to develop and break, and then the fluid hardens into a dry scab. The hard base of the pustule has meantime been getting brown, and becoming surrounded by a copper-colored areola. When the scab falls, the elevation constituting the base of the original pustule remains as a papule, with a faint central depression. This papule becomes gradually absorbed, leaving a purplish, pigmented discoloration, which is very slow to disappear. Sometimes a slight, superficial ulceration remains. This is followed by a minute, round, white, depressed cicatrix, very different from the puckered scar of ordinary acne.

General syphilitic acne rarely appears before six months after chancre, being later than the superficial pustular syphilide, and earlier than the superficial ecthyma. It may appear very early, indeed as the first eruption, but it is believed to indicate a bad form of syphilis, especially if accompanied by iritis.

Syphilitic acne lasts ordinarily about two months, but this limit may be greatly prolonged by successive crops of eruptions.

Diagnosis.—The coppery areola distinguishes syphilitic acne from other varieties, but where the eruption appears late, and is confined to the forehead, temples, and face, it is sometimes hard to distinguish it from the simple acne occurring late in life on gouty subjects.

(*c.*) *Superficial Ecthyma.*—This eruption is constituted by reddened patches upon which pustules develop. The latter may be umbilicated, much resembling variolous pustules. The pustules vary in size from that of a pea to (occasionally) nearly an inch in diameter. They are round, either scattered or collected into groups, in which latter case they may run together (confluent). The pus is thick, often bloody, and there is a dark-red areola (afterward coppery) around each pustule. The pustules do not repose on a hardened base. The crust is rough, dark brown, with a greenish shade, and underneath it there is ulceration. The latter heals under the scab, leaving a slight cicatrix (often pitted, like the scar of vaccinia), which for many months retains its purple, coppery color, gradually whitening from the centre.

Syphilitic superficial ecthyma is found anywhere on the body, often on the scalp. It occurs in bad cases of syphilis, especially where cachexia comes on early. It rarely appears before about the close of a year from chancre, and may be delayed a couple of years or more. On the other hand, it occasionally comes on as the first eruption, within some weeks after chancre, accompanied by early cachexia, not yielding readily to treatment, and often followed by extensive ulcerations.

Diagnosis.—When febrile symptoms accompany the outbreak of syphilitic ecthyma, as they sometimes do, and the pustules are umbilicated, the disease is not uncommonly mistaken for variola—an error to be avoided by a study of the history of the case, the course of the eruption, and the absence of other symptoms of variola. Cachectic ecthyma may be confounded with the syphilitic. The former appears in children and the aged, chiefly on the legs, is more purulent, more inflammatory, less or not at all pigmented, and has no accompanying history of syphilis.

The superficial ecthyma of secondary syphilis differs from the so-called ecthyma of tertiary syphilis, in that the latter has an elevated, hard, empurpled base, ulcerates deeply, leaves a considerable, depressed scar (not pitted); is, in short, a gummy infiltration of the skin, ulcerating superficially. All the pustular syphilides have the common characters of lack of pain and itching, and the presence of the areola, first of vinous-red, then of copper-color, from the pigment.

Treatment is general. Locally very mild mercurial applications are serviceable.

4. PIGMENTARY SYPHILIDE.—This syphilide has been described by Hardy.[1] It appears between the fourth and twelfth month. It consists of a coffee-colored pigmentation of the skin, without elevation of the surface and without desquamation. The size of the spots varies from that of a silver five-cent piece to a quarter of a dollar. The borders of each spot are irregular, many of the patches run into each other. The intervening skin seems whiter than normal.

This eruption occurs chiefly at the sides of the neck, perhaps extending down over the breast. It may be found elsewhere. Lymphatic patients, with white, fine skin, chiefly women, are subject to it.

Diagnosis.—In pityriasis versicolcr there are desquamation, itching, and the parasite constituting the affection may be readily demonstrated by the microscope. Freckles are smaller and more generally distributed, never confined to the neck.

Remarks.—This eruption is sometimes, possibly always, simply a pigmentation left behind by a roseola. It is often very faint, so that it can only be seen by viewing the neck sidewise with the light shining across it. It is found in some patients who deny any previous eruption upon the site occupied by the pigmentation. It may last one or two months or indefinitely, and is entirely uninfluenced by treatment. It is rarely detected by the patient, and is of little importance, except as an additional means of diagnosis in obscure cases, since it only occurs on syphilitic patients.

5. BULLOUS SYPHILIDE.—A syphilitic pemphigus upon adults has been observed in a few cases (Bassereau, Zeissl) occurring among the secondary symptoms, confined to the palms, soles, backs of the fingers,

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[1] "Leçons sur la Scrofule et les Scrofulides et sur la Syphilis et les Syphilides," Paris, 1864, p. 175.

and bends of the elbows, and relievable by mercurials internally. This eruption, so common in inherited syphilis, is of the utmost rarity in adults.

6. Vesicular Syphilide.—This is a rare form of syphilitic eruption. There are three varieties:

(*a.*) Varicelloid syphilide;
(*b.*) Syphilitic eczema;
(*c.*) Syphilitic herpes.

(*a.*) *Varicelloid Syphilide.*—This form comes early if at all, before the sixth month after chancre. Small, red, perhaps slightly elevated spots appear as large as a pea. Upon these arise one or more pointed, round, or umbilicated vesicles, surrounded at their base by a dark-red areola afterward becoming brown. The contents of the vesicles quickly become purulent and dry up into a greenish-brown, adherent crust. This scab falls in about a fortnight, leaving a purplish discoloration, which slowly disappears. There are usually but few spots of eruption, scattered over the face, limbs, and body. Successive crops of vesicles may prolong the eruption for several months, and ordinarily some other early syphilide coexists with it.

Diagnosis.—When there is considerable syphilitic fever, there is danger of confounding this eruption with varioloid. This may be avoided by observing the color of the patches, the areola around them, the course of the affection, and concomitant symptoms.

(*b.*) *Syphilitic Eczema.*—This is a vesicular eruption, not very common, appearing chiefly on the trunk and extremities, rarely on the face. The vesicles are small and acuminated, scattered or united into patches. When scattered, each vesicle is surrounded by the characteristic areola; when in groups, the surface from which they spring is of a vinous-red, which coloration extends slightly beyond the border of the patch. The vesicles behave in two different manners. After remaining a while translucent, they may dry up, the liquid being reabsorbed; slight desquamation follows, the brown areola pales and no scar is left: or the vesicles become purulent, break, and little darkish scabs form (isolated and not confluent as in eczema); the scabs separate slowly and the brown stain disappears, leaving no scar. The eruption, in itself slow, is made more chronic by relapse.

Diagnosis.—In ordinary eczema the vesicles are small, ephemeral, and break quickly, leaving an oozing surface or a confluent scab. The eruption itches, and there is no coppery areola.

(*c.*) *Syphilitic Herpes.*—The patches of syphilitic herpes are situated on a base of specific color. The vesicles are of different sizes, from a grain of millet to a pea. They are arranged in irregular groups or describe circles or segments of circles. The vesicles last about a week, are succeeded by little scabs or by a fine desquamation. After these disappear, the color pales and no scar is left. Successive crops of eruption are the rule.

Diagnosis.—Color, areola, and slowness of development, distinguish this eruption from ordinary herpes. The circinate form does not progress centrifugally, as do other forms of circinate herpes.

Treatment of the vesicular syphilides is general.

7. SQUAMOUS SYPHILIDE.—Nearly all of the eruptions of syphilis go through a desquamative stage, and thus a patch of eruption, which is essentially papular, tubercular, or pustular, may finally become scaly, and, remaining so for a considerable time, pass for a squamous syphilide. So also does pityriasis occur in syphilis, as of the scalp with early alopecia; sometimes in little patches along the margin of the scalp with the other syphilides; again, with syphilitic cachexia, furfuraceous desquamation of the scalp, or even of the whole body, may be encountered, with a dry, rough skin. In none of these cases, however, can it be affirmed that pityriasis is an essentially syphilitic lesion. It is rather a local consequence of general blood deterioration, and may be induced by many causes other than syphilis. There are, however, two varieties of essentially scaly syphilide where the scale is the prominent lesion from the first. These are—

(*a.*) Syphilitic psoriasis, including lepra;

(*b.*) Palmar and plantar psoriasis.

(*a.*) *Syphilitic Psoriasis.*—This eruption occurs in two varieties—as a guttate or diffused psoriasis, and in the circinate (leprous) form. The characters of the eruption are the same in both. They may be met together on the same subject. The patches vary from a split pea to a penny in size—or much larger in the circinate or gyrate form—have (as a rule) the deep syphilitic color, are but slightly elevated above the surface, not papulated. The scales are white, very fine, not adherent, not imbricated (as in true psoriasis). After a few weeks the scales fall. They may be replaced by others, finer than the first, and thus several desquamations occur. Finally, the color pales, and the darkened spot disappears, leaving no cicatrix, provided the eruption has not been a mixed one (tuberculo-squamous), which form does leave scar from interstitial absorption. The circinate form starts as a circle, or segment of a circle, inclosing healthy skin, does not generally increase in size, and lasts from a few weeks in the earlier variety, to some months in the later, where there is more interstitial thickening of the skin. Syphilitic psoriasis does not appear before six months from chancre, and may come on after an interval of many years. It may coexist with other syphilo dermata. Scaly syphilides, appearing before six months from chancre, are usually the remains of previous papular eruptions. Syphilitic psoriasis appears upon the trunk, the members, the face, and along the forehead at the edge of the hair. It shows no tendency to locate at the elbows and knees, like non-specific psoriasis. The later its appearance after chancre, the longer does it tend to remain.

Diagnosis.—When not associated with other specific lesions, syphilitic psoriasis is often difficult to distinguish from non-specific scaly disease. Much light is thrown upon such cases by a study of the previous history, on such points as the well-known inveterate tendency of ordinary psoriasis to relapse, its tendency to outbreak in the spring and fall. Neither eruption itches (usually), and both have the same livid redness of color under the scales, but ordinary psoriasis tends to cluster about the elbows and knees, and upon the scalp; its scales are thick, imbricated, tightly attached, and lying in several layers, so that it is difficult to scrape them all away and get down to the livid redness of the patch beneath, and, when the scales are all rudely rubbed off, the patch is very apt to bleed. Common lepra, where the scales come off in patches, is usually much more extensive in its distribution than the syphilitic variety, and often of indefinite duration, which the syphilitic is not. In syphilitic psoriasis the scales are more lamellar, finer, less adherent, not imbricated, or in thick layers, while the duration of the eruption is not so great. Finally, anti-syphilitic treatment has a marked and often rapid effect in the one form, while it does not modify the ordinary variety.

The circinate form in some of its stages exactly simulates ordinary ring-worm, but the diagnosis may be made by the absence of spores, and by watching the course of the eruption, which, in syphilis, remains stationary, while in ring-worm a progressive centrifugal enlargement is observed.

(*b.*) *Palmar and Plantar Psoriasis.*—This eruption consists of rounded, livid colored patches on the palm or sole, slightly prominent, hard, covered by adherent, grayish scabs. The patches may be isolated or confluent, and may reach a large size, extending up to the wrist, or malleolus. Deep fissures may form upon them, caused by motion of the parts. These may bleed and occasion enough pain to restrict movement of the fingers. At the limits of the patches there is usually a characteristic livid areola. This eruption differs from the small circular depressions of the palm with an undermined circumference of white, hard epithelium, left by the papular or erythematous syphilide of the palm, and already described (p. 575). Palmar psoriasis comes on later in the course of the disease, is often of more considerable extent, and lasts for several months, sometimes for several years.

Diagnosis.—The diagnosis with ordinary psoriasis is difficult, unless other concomitant symptoms lend their aid. Ordinary palmar psoriasis is of a higher color, and not so circular in its figure. It generally itches, has no marked areola, and is pretty sure to coincide with other patches of psoriasis (perhaps at the elbows and knees). Scaly patches confined to the palm or sole always excite a suspicion of syphilis, and call for a profound study of the patient's general condition and history. A patient may have had syphilis and still have psoriasis later, not due to specific disease, and no error is to be more carefully guarded against than that of imagining that, because an individual has once had syphilis, all his subsequent eruptions must necessarily be due to the continued action of the virus. The touchstone treatment quickly reveals the fallacy of this supposition to the intelligent practitioner. Scaly patches, which continue for years in spite of well-directed treatment, are not syphilitic.

Treatment.—Old, obstinate cases of syphilitic psoriasis require local (tar, mercurial ointments) as well as general measures.

8. GENERAL TUBERCULAR SYPHILIDE.—Tubercular eruptions are well on the boundary-line of tertiary syphilis. They are more frequently grouped than discrete, and often leave cicatrices without previous ulceration. Still the eruption does occur in a discrete, general form, and may be ranked as a late secondary or early tertiary symptom. The tubercle is a large papule, involving the thickness of the skin. A subcutaneous, gummy tumor is not a tubercle. Tubercular eruptions, generalized or in groups, are rarely seen early in syphilis. A generalized papulo-tubercular eruption may come on at four or five months, but groups of tubercles rarely appear before a year after chancre, and they may come on at any indefinite date. Bassereau notes a case at forty years. The farther from chancre the eruption appears, the more certain is it to be a patch of tubercles and not a general eruption, and the more marked in such a patch is the tendency to ulceration.

There are two forms of this eruption

(*a.*) General tubercular syphilide;

(*b.*) Tubercular syphilide in groups.

(*a.*) *General Tubercular Syphilide.*—The lesion in this eruption is a solid, round, oval, pointed, or flattened tumor, about as large as a pea, at first shining and of a deep red, then of raw-ham or coppery color. They are scattered irregularly, or lie so as rudely to describe circles or segments of circles. Sometimes the eruption is confluent in spots, in which case the skin between the lesions is similarly colored. After a time a superficial scale covers each tubercle; this becomes detached, and then the little tumor sinks away without ulceration. A slight, depressed, and pigmented spot marks for a time the site of the lesion, which also finally disappears, leaving no trace, or perhaps a very superficial cicatrix behind. This scar is the result of interstitial absorption of the substance of the true skin, and does not necessitate previous ulceration.

Diagnosis.—The general tubercular syphilide appears over the whole body, perhaps more prominently on the face and forehead. Its characters are so marked that it is hardly possible to confound it with any other affection.

Treatment is mixed, with local mercurials.

(*b.*) *Tubercular Syphilide in Groups.*—The lesions in this eruption are usually smaller than in the disseminated form, otherwise the same description applies to them. They may be no larger than a grain of millet, but they seem to involve a considerable thickness of the true skin. They may be assembled into irregular groups of rounded contour, or form circles, segments of circles, figures-of-eight. Sometimes each tubercle continues distinct from its neighbor, or they may run into each other, forming a continuous raised welt, inclosing healthy skin, or a roughened, thickened, livid patch. In the circinate form the first tubercles undergo absorption, and are replaced by others circumferentially, causing the ring to grow larger centrifugally, as in ringworm, except that the tubercles which have disappeared usually leave little, smooth, round cicatrices behind, first livid, then white. Patches of very small tubercles leave no scar. Groups of tubercles may occur anywhere, but the forehead, cheeks, lips, and nose, are favorite sites. Groups of syphilitic tubercles, in the period of decline, become covered by a fine desquamation, and, as each patch lasts a considerable time (from a few weeks to several years), the eruption goes by the name of tuberculo-squamous syphilide. Such patches show the tubercular character of the eruption more strongly at the border where fresh tubercles are springing up, while toward the centre of the patch many round, white, smooth, thin cicatrices show where tubercles had previously existed. Such patches are encountered mainly about the forehead and nose. This scarring without ulceration is caused as follows: The syphilitic tubercle is due to a diffuse hyperplasia of small cells in the substance of the true skin. These cells, which partake of the nature of so-called gummy exudation, grow at the expense of the natural tissues, and cause the atrophy of more or less of the substance of the latter, even while there is apparently an hypertrophy, as evidenced by the little tumor called a tubercle. When, however, the adventitious, newly-formed cells go into atrophy, and are absorbed during the progress of the eruption, then, not only does the tubercular prominence disappear, but the scar left attests the atrophy and absorption of the true elements of skin-tissue, which took place during the deposit of the morbid material.

This element is of diagnostic importance. In only two eruptions—the tubercular (non-ulcerated) syphilide, and the tubercular (non-ulcerated) scrofulide in groups (i. e., tubercular non-ulcerated lupus)—is this important feature observed, and the mechanism of the formation of scar is the same in both eruptions. Groups of syphilitic tubercles may soften rapidly and ulcerate, but then the affection becomes frankly tertiary in type (*see* p. 595). The course of this syphilide is always slow, its duration being extended by successive crops of tubercles.

Diagnosis.—It is perhaps possible to confound the circinate form of tubercular syphilide with ringworm, but the greater infiltration of the skin, and usual existence of scars, deeper color, and absence of spores, should protect the practitioner from error. Patches of syphilitic tubercles on a livid base are very apt to be mistaken for non-ulcerative lupus.

In this latter affection the tubercles are flatter, softer, partially translucent, less livid; there is some swelling of the subcutaneous, cellular tissue; the cicatrices upon the patches are puckered, irregular, often ridged with flat, tight, adherent, shining portions, resembling somewhat the cicatrix of a burn, usually with a few veins running over the surface.

Treatment of the tubercular syphilides is *mixed*, with, locally mercurials.

CONCOMITANT SYMPTOMS ON MUCOUS MEMBRANES.

The affections of the mucous membranes found in secondary syphilis are four:

1. Erythema;
2. Ulcers;
3. Mucous patches;
4. Scaly patches.

1. Erythema.—The hyperæmia of mucous membrane seen in secondary syphilis usually attacks the fauces. It generally comes on from three to eight weeks after chancre, and looks and acts a good deal like the erythema occasioned by ordinary cold. It often extends backward into the pharynx and upward into the posterior nares, possibly occasioning a little deafness, especially if the tonsils become engorged, as is not infrequently the case. The nasal mucous membrane is sometimes similarly affected, occasioning symptoms of ordinary catarrh. It occasionally extends downward into the larynx, resulting in slight catarrhal laryngitis, with hoarseness and some cough, occasionally temporary loss of voice. Diday[1] mentions an aphonia occurring early in syphilis, where the voice is not visibly affected, except in the higher notes (in singers), which cannot be sounded. A few days of mercurial treatment restores the voice. The lesion is evidently hyperæmia. Erythema of the fauces is often attended by œdema of the sub-mucous tissue. Faucial erythema usually accompanies the earliest outbreak of cutaneous syphilis. The tendency to the formation of ulcers or mucous patches upon the erythematous surface is great; but, if these do not form, the diagnosis of the affection is not revealed by any special characteristics it possesses, unless it be that the inflammation is less frank, the color more dusky, and the complaints of the patient less urgent than they would be from a similar amount of hyperæmia dependent upon a cold. The syphilitic erythema is sometimes seen in patches, and may be punctate.

Ricord, in his "Iconographie," gives a plate (XV.) of an erythema of the glans penis coinciding with a cutaneous roseola, and this phenomenon, by no means common, may be occasionally observed. Bumstead[2] noticed it in a case prior to the detection of any cutaneous symptom.

The erythema of the throat may resolve, or (more frequently) ulcers or mucous patches appear.

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[1] *Gazette Médicale de Lyon*, 1860.

[2] *Op. cit.*, p. 577.

Treatment.—The early erythematous sore-throat, if severe, requires local in addition to constitutional treatment. If swelling and pain are considerable, inhalation of steam and hot fomentations around the neck are soothing. Lactucarium, codeia, or an opiate, is often useful to quiet pain and prevent coughing. The patient should be advised to talk as little as possible, if there is any hoarseness. Flaxseed-tea, containing chlorate of potash in the strength of gr. v–x to the ounce, is useful in tablespoonful doses every hour or two. Saline laxatives, if the inflammation runs high. Gargles are not of much service if the throat is painfully inflamed. Hot milk as a gargle is soothing.

2. ULCERS.—Ulcers superficial in character, round, oval, or irregular in shape, are found upon the mucous membranes early in secondary syphilis. They are very frequently encountered in connection with the erythema above described. Their favorite seat is in the fauces, upon the tonsils, on the half-arches, on the soft palate and uvula, along the sides and tip of the tongue, especially if there be a rough portion of projecting tooth, against which the tongue rubs, on the inside of the cheeks, very often at the angles of the lips, inside the lower lip, under the tongue, along the frænum, etc.; in short, any portion of the mucous membrane of the buccal cavity may be affected, even the gums. These little ulcerations are usually superficial in character at first; if they become deeper, the border thickens, grows red and angry, and a dirty-white pellicle covers the lesion. If they remain superficial, the mucous membrane seems to have been rubbed off, leaving a raw surface, smooth, glistening, red at its edges. Salt, pepper, etc., on the food occasion sometimes a stinging sensation at the abraded points. The surfaces of these ulcerations are prone to become aphthous, covered by a grayish-yellow exudation. Ulcerations of similar character may affect the nasal and genital mucous membranes in both sexes, especially if the parts are not kept perfectly clean.

The superficial ulcers appear early and late during the whole course of secondary syphilis. Lack of cleanliness, the use of tobacco, imperfect teeth, etc., are efficient exciting causes. The ulcerated surfaces sometimes vegetate, i. e., become covered by exuberant granulations.

Deeper ulcers in secondary syphilis may depend upon continuance and extension of the foregoing variety, from continued irritation (a projecting tooth, use of tobacco); or result from ulceration of mucous patches. The favorite seat of such deeper ulcerations is on the tonsils. The whole of the fauces may become brawny around them, dusky in color, thickened. The ulcers themselves have raised, sharply-cut borders, yellow, unhealthy bases, and bear a strong resemblance to ordinary chancroid. They are encountered also at the angles of the lips, inside the cheeks, on the tongue, and are found upon the preputial mucous membrane, and about the anus, extending up into it. They often lead to considerable destruction of tissue in a slow, chronic way, eroding the whole tonsil, or at the anus destroying tissue and resulting ultimately in stricture. This ulcer and ulcerated chancroid are the most frequent causes of so-called syphilitic stricture of the rectum.

The ulcers above described belong to secondary syphilis. They commence superficially and not from within, and are *thus distinguishable (as well as in their march) from gummy* ulcerations of mucous membranes *belonging to tertiary* disease.

The symptoms of ulcerations of the fauces usually complained of are sore-throat, perhaps difficulty in swallowing, and ofter pain under the jaw, caused by sympathetic swelling of the submaxillary glands.

That erythema and ulceration of the other mucous membranes, œsophagus, stomach, intestine, bladder, urethra, etc., may occur in secondary syphilis, although highly probable, is not proved. Symptoms from these quarters are uncommon. Tertiary ulcerations are known to affect these membranes.

Treatment is general and local. (*See* after SCALY PATCHES.)

3. MUCOUS PATCHES.—The mucous patch is a lesion peculiar to syphilis. It is a round, oval, or oblong, pale or rosy, moist spot, usually elevated above the integument, sometimes flat or even depressed. The surface is slightly, sometimes heavily, furred, especially in the mouth. This lesion occurs plentifully about all the mucous orifices, especially around the anus, throat, mouth, and in the preputial *cul-de-sac.* It may develop upon the site of an existing chancre, converting the latter into a mucous patch. The true skin may also be covered by mucous patches, chiefly in regions where two surfaces of skin lie in contact, especially if they are also habitually moist; under the female breast, on the scrotum, or upper part of the thigh, between the toes, at the umbilicus. They are seen also at the edges of the nails. The soft skin of babies is peculiarly subject to mucous patches. Mucous patches vary in size, from the head of a large pin to that of a penny, or become larger if several run together. When occurring upon the skin, they are occasionally dry, wart-like (condylomata), elevated considerably above the surface. Sometimes upon the skin they scab over. Condylomata are seen to best advantage about the anus, perinæum, and scrotum; but even upon the skin the whitish moist pellicle, resembling furred mucous membrane, may cover them. The surface of a mucous patch either upon the skin or mucous membrane may granulate, forming a prominent vegetating surface. Mucous patches around the anus and genitals, especially in the preputial *cul-de-sac* (vagina in female), are very constantly attended by the formation of a viscid, badly-smelling secretion, which, in its turn, if not removed, irritates the skin, causes itching, and may excite a plentiful outcrop of vegetations, lack of cleanliness being the immediate cause of these latter, which themselves are accidental, and not in any sense syphilitic. Mucous patches subjected to friction, or left dirty, are apt to ulcerate. Such ulcerations are seen about the

anus, extending perhaps into the rectum, along the sides of the scrotum from friction, between the toes, where they may become very painful, at the angles of the lips, on the tonsils.

The secretion of mucous patches is contagious, and when they are present on the lips, or anywhere within the buccal cavity, the patient cannot be too urgently warned of the possibility of spreading the disease among members of his own family, by kissing or using the same spoon, cup, pipe, etc., as other members of the household. Mucous patches of the mouth are often of irregular shape, owing to the irritation of friction against the teeth. At the angles of the lips, and on the dorsum and sides of the tongue, they are often more or less fissured. The whitish pellicle on the surface is thick and adherent, sometimes covering the whole patch, sometimes having a circinate distribution. The buccal patches are usually flat, sometimes slightly depressed. Upon the tongue they may vegetate, while extensive ulceration upon the tonsils is not unusual. In connection with such ulcerations, the tonsils swell, there is a good deal of inflammatory thickening and induration around, swallowing may become painful, the submaxillary glands enlarge.

Since the use of the laryngoscope, mucous patches have been repeatedly seen within the larynx[1] and trachea.[2] They do not become large in these situations, or secrete much, and they disappear in a few weeks, even without treatment.

Symptoms are hoarseness, perhaps aphonia, no pain, cough, or expectoration.

Mucous patches come on with the earliest syphilides. They appear upon the skin, usually in connection with the papular syphilide, especially the broad, flat variety. They may outlast several crops of different eruptions, and they relapse (especially about the lips, tongue and tonsils) with more pertinacity than any other symptom of syphilis. They occur late along in the secondary and even in the tertiary stage of the disease, but become gradually less and less prominent, until finally they pass over into the scaly patch of mucous membrane, so closely resembling the mucous patch in some of its features.

Nothing is of more importance in the prevention of mucous patches than thorough cleanliness, nothing more active as an exciting cause (upon a syphilitic patient) than local irritation, prominently the use of tobacco, smoked or chewed (for the mouth), or snuffed (for the nose), the retention of a naturally irritating secretion from lack of cleanliness (for the anus and genitals). Mucous patches do not leave cicatrices unless they have ulcerated deeply.

Treatment is general and local. (*See* after SCALY PATCHES.)

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[1] Gerhardt and Roth, "Virchow's Archiv.," xxi., 1861. Türck, Ziessl, "Const. Syphilis."

[2] Siedel, "Jenaer Zeitschrift für Medizin," 1866.

4. **Scaly Patches.**—These patches, sometimes described as mucous patches, and sometimes as psoriasis, resemble mucous patches to casual inspection, but are found on closer observation to differ. They appear on the inside of the cheeks, especially near the angles of the mouth, and on the sides, tip, and dorsum of the tongue. They are rounded or irregular in shape, often gyrate on the back of the tongue. They are flat, smooth, shining, and of the bluish-white color of skimmed (city) milk. When mild, they are not at all sensitive. When severe, they become whiter in color, and the epithelium, whose thickening constitutes the lesions, cracks in places, causing pain. A portion of the epithelium may grow out from the surface, hard, white, adherent, feeling like cartilage. These patches are epithelial hypertrophy. The scales are very firmly adherent, so much so that it is often impossible to scrape them off, and very rough handling fails to provoke bleeding. The patches may become confluent and cover the greater part of the dorsum of the tongue, making it feel stiff and uncomfortable for the patient.

These patches sometimes occur along with the true mucous patch, but usually they appear later in the course of the disease. They may be found at any time, even during tertiary syphilis, and often remain long after all other symptoms have disappeared. They are sometimes seen in inherited syphilis. Smoking is an efficient exciting cause. They are rebellious to internal measures, and are more effectively treated locally. They indicate a continuance of the syphilitic diathesis.

Treatment.—Ulcers, mucous and scaly patches of the mouth and fauces often require other local measures in addition to those advised for erythema of the fauces, which latter are equally serviceable in cases of ulcer, where the accompanying inflammation runs high. The local measures most efficient are removal of all local sources of irritation, which alone are often capable of keeping up the trouble in spite of the best-directed general treatment, such as stumps and ragged edges of teeth; disuse of tobacco, chewed or smoked, and of strong drink, stimulating or highly-seasoned food; a mouth-wash containing chlorate of potash, or tincture of myrrh, carbolic acid, or Labarraque's solution, the latter, if there be any offensive odor; careful cleansing of the teeth and gums with a soft brush. These measures, combined with internal treatment, are often all that is required.

Where, however, a speedy effect is desired, direct topical applications are indispensable. One of the most efficient of these is the vapor of mercury. The best way of using this powerful agent is as follows: Direct the patient to procure at a tin-store a piece of tin ten inches long by three and one-half broad. This should be bent to a right angle at two and one-half inches from either end, or at a convenient distance for the action of a flame from a low (tin) spirit-lamp placed beneath the table, formed by bending the ends of the tin (Fig. 132).

Upon this "table" the powder to be inhaled is scattered, the inhalation being made by holding the mouth over it, or preferably a piece of paper twisted into a cone, the large end receiving the fumes. The powder found most efficacious is calomel, of which gr. ¼–ij rubbed up with two grains of chalk, to prevent too rapid volatilization, is sufficient for a dose, to be repeated three or four times daily. This method of treatment is often promptly effective where the whole tongue is covered with extensive scaly patches, and where large chronic ulcers exist about the mouth and throat.

There is an objection to the treatment, however, which prevents its use in some cases; namely, the provocation of great irritation of the throat, causing severe and prolonged paroxysms of coughing. Many patients suffer no inconvenience from the inhalations; others cough considerably during and immediately after having inspired the mercurial fumes; with others no inconvenience is felt at the time, but after perhaps half an hour a violent paroxysm of coughing will come on. Commencing with a small dose (gr. ¼), no accident need be feared as a rule, while the good effect is often quickly perceptible.

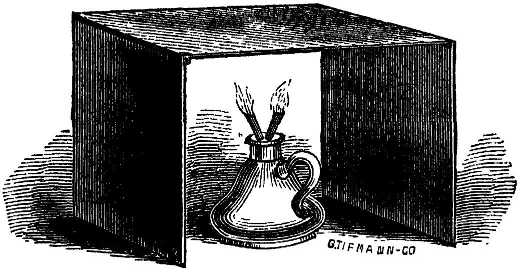

FIG. 182.

There are many other valuable local applications in general use. Sulphurous acid diluted (Shillitoe) is the best, used (ʒ j–ij–℥ j) in spray with an atomizer. Bumstead speaks favorably of a saturated solution of nitrate of silver applied in spray accurately with the atomizer, and in conditions of subsiding acute inflammation praises the undiluted tincture of cimicifuga prepared from the fresh root.

Where there are ulcers, angry and inflamed, the topical application of tannin in glycerine (ʒ ss–j to the ℥ j) is often efficient. For isolated scaly mucous or ulcerated patches frequent light applications of nitrate of silver or sulphate of copper are beneficial, but the best local application is the acid nitrate of mercury. A *very minute* quantity of this caustic is carried to the surface to be medicated upon a glass rod. The application is painful, and the patient is allowed to rinse his mouth at once with cold water.

Mucous patches and kindred ulcerations about the anus, scrotum, preputial *cul-de-sac*, toes, etc., are treated by scrupulous cleanliness, soap and water being followed by Labarraque's solution in water, one part to four or eight, and the washings frequently repeated. Any of the last-named caustics are useful, especially if any of the patches have ulcerated. Otherwise, no treatment is better than dusting the surfaces, after washing and drying, with a powder of equal parts of calomel, oxide of zinc and iodoform (or using different proportions of these ingredients), and keeping contiguous surfaces apart by the interposition of dry lint. Even the vegetations, which spring up around and upon the surfaces of mucous patches, will usually subside under this treatment. If a mucous patch granulates too exuberantly, it should be burned with nitrate of silver or nitric acid.

This completes the study of secondary syphilis, with the exception of certain lesions, which are more conveniently considered under separate heads in connection with tertiary lesions of the same tissues or organs; as in affections of the eyes, ears, nails, joints, tendons, testicle (p. 432), nervous affections, certain forms of all of which may be found during the secondary period.

CHAPTER VII.

SYPHILIS OF SKIN AND MUCOUS MEMBRANES.

The Tertiary Syphilides.—Concomitant Symptoms on Mucous Membranes.

THE results of tertiary syphilis, as seen upon the tegumentary expansions, are most advantageously considered in connection with the lesions of the same structures encountered in secondary syphilis already discussed.

Tertiary is a far graver form of syphilis than secondary. Its presiding genius is destruction, the tendency of its lesions is to softening and ulceration, and the medium through which these changes are effected is a substance known as gummy material, either diffused through the tissues, or collected into circumscribed tumors. This gummy material is a specific neoplasm analogous to tubercle, cancer, lupous deposit, etc. It is an hyperplasia of cells, which have not generally the vitality to become organized. They grow at the expense of the tissue in which they are formed, and, after reaching a certain stage of development, undergo a retrograde metamorphosis, and either become absorbed gradually, without solution of continuity of the tissue in which they are deposited, or break down in mass, occasioning abscess or ulceration—in either case leaving indelible cicatrices behind. Certain of the new formations due to tertiary syphilis become organized, leading to permanent thickening, sub-periosteal exostoses, pachymeningitis, chronic laryngeal thickenings, etc.

Tertiary symptoms rarely appear during the first two years after chancre. After that period they may come on at any indefinite time, having been observed as late as fifty-five years. The appearance of tertiary phenomena (unlike the secondary) is rarely marked by the occurrence of any preparatory or accompanying febrile excitement. Cachexia is apt to accompany them, but even this is often lacking, and, except for the visible lesion upon the skin, the patient may consider himself in perfect health. Tertiary lesions of the skin and mucous membranes are rarely attended by any considerable heat, burning, itching, or pain—in fact, are usually devoid of any sensitiveness whatever. The course of tertiary affections is generally slow, occasionally terribly rapid. Sometimes they yield promptly to treatment, sometimes they are particularly rebellious, lasting for years. As a rule, however, skilfully-directed and long-continued treatment masters them, but it cannot restore lost parts, or remove the indelible. injuries sometimes left by the ravages of the disease.

Tertiary syphilitic cachexia requires a word of description. It occurs at times independently of any visible or tangible lesion; or, again, may accompany any of the recognized forms of tertiary disease. It is probably always due to some physical change (amyloid, gummy) in the blood-making organs or the viscera, or to some nerve-change, rather than to any specific poisonous effect of syphilitic virus—since at this, the tertiary period of syphilis, the virus has lost its transmissibility, and seems to have worn out its intensity by lapse of time, while none the less the changes it has instituted upon the organism continue in full force. Syphilitic cachexia is attended by loss of appetite and strength, and by general anæmia. The sufferer becomes mentally depressed. He looks thin and pinched. The skin is tawny, dry, dirty-looking, without lustre. The hair thins, the epidermis exfoliates excessively, occasioning a more or less general furfuraceous desquamation. The heart and vessels of the neck exhibit the anæmic murmur, the pulse is small and rapid, and some anasarca is apt to be observed. Sleep is disturbed, and mental activity lessened. The patient may be nervous and fretful, or very despondent; occasionally he keeps cheerful.

This general condition indicates great depression of the vital force. It sometimes resists treatment effectually, so that none of the so-called specifics are of any avail. It calls for tonics, and change of life and air, and, if not relieved, becomes progressively worse, either carrying off the patient or favoring his death by some intercurrent malady. The existence of syphilitic cachexia with other syphilitic lesions always demands careful hygienic and tonic as well as (or perhaps rather than) specific treatment.

TERTIARY SYPHILIDES.

The tertiary lesions of the integument are:

1. Ecthyma.
2. Rupia.
3. Pustular syphilide in groups.
4. Tertiary ulceration.
5. Gummy subcutaneous tumor.

With these occur on the mucous membranes:

1. Mucous patches.
2. Scaly patches.
3. Deep chronic ulcers.
4. Destructive gummy ulcers.

1. Ecthyma.—In tertiary syphilitic ecthyma there is gummy infiltration of the true skin. After a few days a pustule appears on the top of the solid elevation. This grows rapidly and breaks, or is scratched off. The matter dries up into a dark-brown scab, perhaps containing a shade of green. Underneath this pus forms, increasing the thickness and roughness of the scab, while the solid portion of the lesion increases also in size, and becomes surrounded by a livid areola. The scab growing from beneath may finally become larger than the ulcer, but the livid areola and the interstitial thickening of the skin extend usually beyond it. Often the scab is depressed, let-in, as it were, inlaid into the skin, and firmly adherent to it. If removed, an ulcer, with sharp-cut edges and pultaceous floor, is found, very closely resembling a chancroid.

This form of deep ecthyma may occur separately or in groups; in the latter case giving rise to a scabbed patch of irregular form, under which there is ulceration, which may become circumscribed and heal under the crust, or, rarely, advance as a serpiginous ulcer.

The favorite seat of this eruption is the lower extremities. It may occur anywhere upon the body. The duration is often many months, by successive crops of ecthymatous pustules. An indelible, often deeply-depressed scar results, which remains of a livid color long after the fall of the scab, and is bronzed more or less in different subjects. Blanching commences centrally, until finally the cicatrix is of a pearly white, perhaps surrounded by a faint ring of pigment, which is slower in disappearing.

Mixed treatment is the most valuable.

2. Rupia.—The lesion in rupia is a bulla, quickly becoming pustular, the pus usually mixed with blood. It may be a flat pustule. It varies from the size of a pea up to (in bad cases) a penny. It rests usually upon a flat base surrounded by a red areola. The pustule breaks in a few days or dries into a crust, under which ulceration progresses. New supplies of pus are furnished from beneath, while the ulceration progresses slowly at its circumference. Thus the first crust becomes lifted up by the formation of a slightly broader layer of scab beneath, and, this process going on for weeks or months, finally a prominent, rough, oyster-shell-like scab results, marked by concentric layers, of a blackish-

brown color often shaded with green. A new bullous ring may form outside the crust, and, in drying, rapidly increase the size of the latter.

These scabs may grow to over an inch in height and reach enormous lateral dimensions, especially if the ulcerations under several bullæ have become confluent. Pressing upon the crusts will usually cause pus to ooze out from the side. The scabs may remain on until cicatrization has occurred, and then, falling, leave a purple, depressed, slightly irregular spot, which behaves like the spot left by deep ecthyma, finally becoming white. On the other hand, the scabs sometimes become detached, leaving an indolent ulcer with sharp-cut borders of chancroid-like aspect, and tending to extend superficially but not in depth.

Rupia is found upon all portions of the body, scattered or in groups, and may coexist with other tertiary or late secondary lesions (patches of tubercles, scaly patches). It is believed to indicate a bad general condition.

Treatment is mixed, combined with a large share of tonics and hygiene.

3. Pustular Syphilide in Groups.—In this affection a red spot first appears. Upon this a group of small pustules develops. These become confluent and break, their secretion drying up into a thick, greenish crust. Outside of this the purple color forms an areola, as in the other varieties of syphilitic ulcer covered by a scab. The ulcer extends slowly and the scab keeps pace with it or falls off in part, showing a granular (perhaps fungous), unhealthy ulcer beneath, secreting a sanious, plastic pus, which readily reconcretes into scab. The scab so formed is broken up, granular, cracked, and not prominent as in rupia. New pustules at the circumference slowly tend to increase the size of the patch. After a time it becomes limited, the scab contracts and dries up, the areola becomes more bronzed; finally the scab falls, leaving the characteristic scar, which whitens very slowly, especially on the lower extremities. Instead of healing under the scab, the ulcer may become serpiginous, extending superficially but not in depth.

These patches occur singly or several at a time upon any part of the body, but preferably upon the face, scalp, neck, and breast.

Diagnosis.—The pustular syphilide in groups is liable to be confounded with the pustular scrofulide in groups, both having the same general character. The scab of the latter, however, is black or light colored, not greenish; the borders of the ulcer are irregular, fringed, undermined; in the syphilide, smooth, sharp-cut, abrupt, adherent. The chancroidal aspect of the base and the coppery areola are only marked in the syphilitic affection. The color of the scrofulide is paler. The cicatrix of the syphilide is smooth, depressed, thin, violet; at first bronzed, then white; of the scrofulide, irregular, prominent in parts, perhaps puckered, adherent; violet at first, then pinkish white.

Treatment is mixed, with iodide in excess.

4. TERTIARY ULCERATIONS.—The syphilitic ulcer appears in two varieties:

(*a.*) Superficial ulceration, stationary or serpiginous.

(*b.*) Deep, destructive ulceration.

Probably all ulcers encountered in syphilis, even in the very superficial forms seen in secondary syphilis, are due to the softening of the so-called gummy exudation, since this exudation is nothing more than aborted connective tissue—connective tissue gone astray under the influence of the syphilitic poison. In fact, all the lesions of syphilis, external or internal (except the purely congestive), are dependent upon this cell hyperplasia; but the longer after chancre it occurs, the more prone it is to collect in considerable masses, to form rapidly, and to soften and disintegrate promptly, thus breaking down into ulceration and sweeping away any tissues in which it may happen to have been deposited. This considerable collection of new-formed, lowly-vitalized cell-hyperplasia, infiltrated through the structures of the true skin or involving the subcutaneous tissues as well, is always the precursor of syphilitic tertiary ulceration.

(*a.*) *Superficial Ulceration, stationary or serpiginous.*—This form of ulcer may commence as rupia, ecthyma, or a crop of pustules, the ulceration, naturally occurring under the scabs of these lesions, instead of healing slowly, either shedding the crust and remaining indolent and superficial, or progressing in a serpiginous manner. Often, however, the precursory lesion is the tubercle; a group of which, hard, shining, livid, indolent, varying in size from a small pea to a small nut, after remaining a while stationary, soften, inflame, and ulcerate.

This ulceration has the syphilitic characters—sharp-cut, prominent, hard, adherent borders, a smooth, indolent, false-membranous bottom. There is habitually no pain. An ulcer so instituted may remain long stationary, but usually gradually becomes serpiginous, i. e., creeps over the surface. The advance may be centrifugal in all directions, or along a narrow track in curves, inclosing healthy portions of skin; or, what is most common, advance may take place in one direction, while the opposite edge of the ulcer is cicatrizing. Unless kept off by dressings, such ulcers are constantly more or less entirely covered up by thick, uneven, greenish scabs.

The process of repair announces itself by a limitation of the ulcer, a flattening of its sharp borders; the base becomes red and granular, approaching the appearance of a healthy ulcer, and cicatrization goes on, the scar passing through the usual transformations of the syphilitic cicatrix. This scar may be somewhat uneven, owing to the different depths to which the ulcer has penetrated at different points. Several patches of superficial ulceration not infrequently coexist upon the same individual, usually in different stages, while cicatrices—some white, some bronzed some purple,—show that the disease is already of long standing.

Treatment is very effective, usually, in this form of ulcer, which is not necessarily attended by any marked cachexia. Untreated, successive outbreaks prolong it for years. Relapse is liable to follow a treatment too soon interrupted. The favorite seat of serpiginous syphilitic ulcers is around the joints, on the back, and on the face.

Diagnosis.—Occasionally the serpiginous ulcer is mistaken for old phagedenic chancroid. The distinction is made by a study of the history, the position of the lesion, and, above all, the effect of inoculation; finally, by treatment.[1]

Treatment is mixed, with the iodide of potassium in excess, or, if destruction of tissue is rapid, iodide of potassium alone, in rapidly-increasing doses until progress is stayed, and then by diminishing the dose and adding mercury gradually, as in the mixed treatment. Locally, after poulticing, iodoform and mercurial preparations yield beneficial results.

(*b.*) *Deep, Destructive Ulcer.*—This is a gummy infiltration of the skin appearing in the tubercular form. It occurs by preference upon the nose, the ear, the lip, and the head of the penis. The tubercle is often quite small, and ulcerates so quickly that the ulcers seem the primary lesion; in other cases the tubercles remain some time before softening. A thick, black, rough, greenish crust forms over the ulcer, which continues its ravages beneath, progressing inward, destroying every thing in its track, including cartilage and bone. If the crust be removed, an uneven ulcer is revealed, resembling the deeply destructive, phagedenic chancroid in all its features. Exposure to the air causes the crust to reform. During the whole course of this affection there may be no constitutional disturbance whatever, no cachexia, and locally no appreciable amount of pain or discomfort. This form of ulcer may last for years, with periods of repose and paroxysms of progress. It is not usually so amenable to treatment as the serpiginous ulcer. The whole nose, ear, lip, or large portions of the penis, may be eaten away by it. Its cicatrix behaves like other syphilitic scars, except that it is uneven, from the different depths to which ulceration has progressed, and may be bridged or bridled.

Diagnosis. — The diagnosis is with lupus exedens, true cancer, chancroid; the former for the nose, lip, or ear; the two latter for the rest of the body, especially the penis. Lupus occurs usually in the young, gummy ulceration in the old; lupus has a less livid border, a pure black or light-brown scab. The history throws much light on the subject, and above all things concomitant lesions, exostoses, optic neuritis with mydriasis, gummy ulceration of the palate or pharynx. Finally, the effect of treatment is to be invoked. This form of disease, occurring with inherited syphilis, is almost invariably mistaken for lupus exedens, and treated as such.

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[1] This question of the diagnosis of these two forms of ulcer is continually arising in practice. The points have been critically studied on page 486.

Epithelioma commences as a tubercle or a wart, which remains a long time before beginning to ulcerate; the borders of the ulcer are everted, knobbed, irregular; the floor is more uneven, the fetor greater, and the neighboring glands become involved, which very rarely occurs for the other ulcers under consideration.

Especially on the glans penis is tertiary, destructive ulceration liable to be mistaken for phagedenic chancroid, and ineffectively treated. There is absolutely no feature among the physical characters of the two ulcers which distinguishes them. Chancroid commences by a pustule, syphilitic ulceration does not; but this can rarely be verified. There is perhaps something distinguishing in the appearance of the ulcers, which appeals to the practised eye, but it cannot be described in writing. Inoculation is an infallible test, the history of the case is of vast importance, the effect of treatment often absolutely diagnostic (*see* Case XLVIII.). Cauterization is rarely more than temporarily beneficial.

Treatment is that of late syphilis. Local applications are not very serviceable.

5. GUMMY TUMOR OF THE SUBCUTANEOUS TISSUE.—Gummy tumor may develop wherever connective tissue is found, consequently it abounds in and under the skin. In the thickness of the latter it forms a tubercle, under the skin a tumor. In rare instances, gummy deposit in the subcutaneous tissue occurs as an infiltration instead of in its usual circumscribed form. The skin becomes raised, thickened, reddened; there are little prominences upon it which ulcerate, and then comport themselves like the syphilitic ulcer. Lancereaux[1] has well described this infiltration, and refers to Vidal de Cassis.

Gummy tumors appear first as little hard subcutaneous lumps, freely movable over the subjacent tissues, the integument slightly movable over them. They are not sensitive to pressure. As the tumors slowly increase in size (they sometimes remain stationary for months), the skin over them becomes involved, and the tumors attached to the underlying tissues so that they cease to be movable. Now a purplish discoloration of the skin commences; the tumor, previously hard and painless becomes somewhat sensitive, and softens centrally, the skin breaks down, and a thick, puriform material, not pus, often mixed with blood, is discharged. After discharging, the lesion remains as a characteristic, deep, indolent, syphilitic ulcer, whose edges at first are undermined, remaining stationary or progressing, and in some cases strongly resembling cancerous ulcers, or, finally, tending to scab over and healing with the characteristic scar.

Gummy tumor often forms under the periosteum of superficial bones (clavicle, skull, tibia, ulna), grows quickly, and may ulcerate, and behave like the corresponding lesion, subcutaneously situated, the differences being: that it is deeply attached from the first; that bone may be felt through the ulcer, and that a superficial scale of bone may become necrosed, thus complicating and prolonging the case (carious ulcer). Subcutaneous or sub-periosteal gummy tumor, instead of coming quickly to the surface, may diffuse itself laterally after softening, and occasionally burrow a short distance before opening.

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[1] *Op. cit.*

Subcutaneous gummy tumor may be single or multiple. The most frequent seat is on the buttocks, neck, head, and extremities. They rarely reach a size larger than a nut, but may become as large as, or larger than, an egg, after softening. Their structure, here as elsewhere, is small rounded cells, more or less gelatinous; granular, intercellular tissue, with a few fibres, fusiform cells, and small vessels. The constant tendency everywhere is to undergo retrograde metamorphosis, either liquefying and ulcerating out, or becoming cheesy and going through absorption with or without cretification.

Treatment is that of late syphilis, by the iodide of potassium.

AFFECTIONS OF MUCOUS MEMBRANES ENCOUNTERED WITH TERTIARY SYPHILIDES.

These are four:

1. Mucous patches.
2. Scaly patches.
3. Deep chronic ulceration.
4. Destructive gummy ulceration.

The first three of these conditions have been already described (p. 585). It is only necessary to add further that mucous patches become less frequent, and scaly patches (sometimes called "milk-spots") more common as the distance in time from chancre is increased. The chronic ulcers of the fauces or mucous membrane of the cheeks at or near the angle of the lips, surrounded by more or less brawny infiltration of the neighboring tissues (already described), are found in tertiary as well as in late secondary syphilis. They are similar to some of the serpiginous or stationary chronic cutaneous ulcers, and undoubtedly often depend upon a moderate amount of gummy infiltration of the tissues. A favorite seat for these late gummy ulcers is the posterior wall of the pharynx, high up, often extending into the posterior nares, and encroaching on the upper surface of the soft palate, which is not necessarily involved. To see them it is often necessary to lift up the soft palate with a suitable curved probe, while the mouth is widely opened, or even to use an inverted laryngoscopic mirror. These ulcers have raised borders, are covered by a tough, whitish secretion, are often raw-looking in parts. They are encountered also on the mucous membrane of the nose, causing a slight catarrhal flow, and accompanied by the occasional discharge of bloody scabs from the nose, or "hawked up" in the morning while clearing the throat. When the ulcers are extensive (serpiginous), they indicate long-standing, inveterate disease. Their presence may occasion pain in swallowing, and perhaps in breathing.

Treatment.—Any of the local means detailed at page 588 may be resorted to with advantage, except the caustic preparations last mentioned, which should not be applied over a large surface. Great cleanliness, constant gargling with chlorate of potash, tannin and glycerine used with a brush, and sulphurous acid in spray, leave little to be desired in the way of local applications. The mixed internal treatment, with a preponderance of the iodide of potassium, is slowly but surely curative. Local measures are of secondary importance. Where the nose is involved, it is difficult to maintain cleanliness without the use of the nasal douche. In applying the douche it is essentially necessary to send the stream up through the nostril which is most obstructed, so that the fluid may readily return through the more open nostril. If this precaution be neglected, and the fluid flows up more readily than it can escape, there is danger of some of it being forced into the Eustachian tube, and lighting up inflammation of the middle ear. The posterior nasal syringe and retro-pharyngeal syringe complement the douche. By these two means the cavity of the nose may be thoroughly cleansed with warm water, and subsequently medicated with mild solutions of borax, chlorate of potash, permanganate of potash (gr. j–℥ iv), or a strong solution of common salt.

4. Destructive Gummy Ulceration.—This form of ulcer is one of the most serious encountered in syphilis. It may develop as a gummy nodule or as diffuse infiltration of the sub-mucous tissue, or be primarily sub-periosteal on the wall of the pharynx, or in the nasal cavity, or on the hard palate. It develops first as one or more deep, round, hard, insensitive swellings, possibly a diffuse infiltration. The mucous membrane may be unchanged in color at first or slightly yellowish, if the tumors are superficial. As the latter grow, the membrane over them darkens in color, becomes œdematous, then softens and rapidly gives way, leaving a deep, irregular yellow ulcer, with distinct loss of substance, surrounded by a line of inflammatory redness. Such ulcers often spread with alarming rapidity, perforating the soft palate or cutting off the uvula within a few days, even hours. The explosion may take place as if by electricity, and twenty-four hours deprive a patient of his soft palate. Deglutition is sometimes painful, sometimes painless, according to whether or not the ulcer is put upon the stretch in swallowing. Any subjacent bone becomes rapidly eroded and necrosed, so that the progress of the ulcer may destroy all the soft and portions of the hard palate, more or less of the turbinated and ethmoid bones, with the vomer and portions of the posterior bony wall of the pharynx, leaving a vast ulcerated cavity to represent what was the fauces and pharynx. The disease may extend inward occasionally and affect the membranes at the base of the brain, giving rise to epilepsy or other nervous phenomena. The voice becomes nasal, food and drink pass forward and out of the nose in swallowing, and yet with

all this the patient may be cheerful and suffer little, often absolutely no pain.

The secretion of these ulcers is very foul and has a peculiar odor, in itself suggestive if not pathognomonic. Portions of bone die and are discharged from time to time, or may become encased in new bone during the process of repair. The dead bone, thus remaining encased, acts as a local irritant, and keeps up ulceration and suppuration perhaps long after treatment has removed all progressive disease.

When taken early these ulcerations yield readily to energetic treatment, later they may prove very rebellious. But Nature accomplishes wonders when repair does take place. Cicatrization binds down any portions of the soft palate which may have escaped destruction, and leaves a characteristic seamed and distorted condition of the pharynx, perhaps entailing a permanent alteration in the voice, sometimes rendering the deglutition of fluids difficult, and perhaps only leaving a small opening to mark the site of the uvula. Such a condition of throat is always the result of syphilis, never of scrofula, or so rarely that practically the word " never " is allowable. It has been written that scrofula may cause these throat-ravages in children, because children are found on whom a syphilitic history or parentage cannot be traced, who have ulcers and other evidences of so-called scrofula and destructive ulceration of the soft palate, perhaps not so promptly relievable by the iodide of potassium as similar fresh conditions in the adult. Yet the iodide of potassium is usually given for these cases and with benefit.

The following is a good illustrative case:

CASE LI.—A girl, aged sixteen, had, in childhood, ulceration of the throat, which had cicatrized, leaving the soft palate bound to the pharynx and a permanent cicatricial slit in place of a uvula. She was an orphan, never had had an eruption that she remembered, had perfect incisor teeth, had had no interstitial or other keratitis. A chronic destructive disease involved the end of her nose, including both nostrils and part of the upper lip. She had been treated for a long time as a case of lupus, and had derived no benefit therefrom. The destructive ulcer at the end of the nose (although the scab was distinctly of a greenish black, very thick, rough, and adherent), had been burned twice with the red-hot iron without benefit. A few weeks of large doses of iodide of potassium brought about cicatrization.

Treatment.—It is rare in the practice of medicine that the surgeon has an opportunity to do good so certainly and so promptly as in commencing destructive gummy ulceration of the fauces. It is useless and unnecessary to trifle with local measures: only one thing is necessary, and that is the iodide of potassium in sufficiently large doses. It should be commenced not at five but at gr. x–xv doses, and run up from there, watching the stomach, until the local lesion yields and the ulcer puts on a bright color. The stomach must be respected, by substituting the iodide of sodium, if necessary, for the more irritating salt, possibly giving it by the rectum. Where the lesion is already old and extensive destructions exist which are still progressing, the same treatment is applicable, carried high enough to control advance of the ulceration, but not pushed so rapidly. There is no limit to the dose except the production of its effect. A patient at the Charity Hospital, with old disease which had destroyed both hard and soft palate, with most of the bones of the nose, had to be carried up to ℥ ij daily before the desired effect was reached. In all old cases not rapidly advancing, especially where the nasal cavity is involved, advantage is derived from the local treatment, as suggested, at page 588. When the ulceration has been arrested and cicatrization is nearly perfect, discharge, odor, scabs from the nose, are sometimes kept up by a piece of necrosed bone, surrounded by a partial involucrum. No amount of continuation of treatment is of service in such a case. The dead bone can usually be felt with a probe. An operation for its removal, if feasible, will be followed by a cessation of the symptoms.

The numerous other manifestations of tertiary syphilis will be considered in connection with the secondary forms of disease under sections devoted to the different organs and tissues of the body, as the eye, testicle (p. 432), larynx.

CHAPTER VIII.

SYPHILIS OF THE EYE.[1]

The EYELIDS.—Chancre, Mucous Patches, Gummy Tumors, Ptosis.—The Conjunctiva.—The Cornea.—The Iris.—Mydriasis, Iritis, Varieties and Complications, acquired and hereditary.—Prognosis.—Treatment.—Vitreous Humor, Hyalitis.—Crystalline Lens, Cataract.—Cyclitis.—Choroiditis, exudative and atrophic.—Retinitis.—Neuritis Optica.—Paralysis of Muscles.—Periostitis.

ALL the tissues of the eye and its surrounding parts may be affected by syphilis. The influence is either direct or indirect, and the disorders thus induced are usually grave, are sometimes tedious, and are prone to do damage to vision. They can rarely with safety be left to take their own course, and in a satisfactory degree they yield to suitable and early treatment.

The imprint of syphilis on the eye may be made during any period of its career. Even chancre has been found upon the superficial parts, while, during the secondary and later stages, a variety of lesions may appear. Hereditary syphilitic taint finds expression in disease of the eye as a frequent occurrence.

To give due attention to the various lesions which may occur, I adopt the anatomical order from without inward, both for simplicity and completeness.

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[1] Chapter VIII. is written by Prof. Henry D. Noyes, M. D., at the request of the authors, who fully indorse the opinions therein expressed. It appears in the first person, as conveying the personal experience and convictions of the writer.

The parts which we begin upon will be THE EYELIDS.

Here *primary chancre* has been noticed both in adults and in children. The sore presents the same appearance as when situated on the genitals, and does not require any special remark as to treatment. If the sore be on the cutaneous surface, it does not greatly endanger the eye; but, if on the mucous surface, or, as has been seen, on the caruncle, it becomes a serious thing. The accident is, however, so rare that it does not seem worth while to enlarge on the subject.

Mucous patches occur both on the cutaneous and conjunctival surfaces of the lids. I have seen them as large as a three-cent piece, but have not seen any more serious result come from them than a slight catarrhal conjunctivitis. Weak astringent washes, as of alum or sulphate of zinc, or touching them with a solution of nitrate of silver, gr. v vel x aquæ ad ℥ j, is all the needful local treatment.

Various forms of secondary *cutaneous eruptions* may appear on the skin of the eyelids, as upon other parts of the surface, and the eyelashes and brows are liable to be lost when the hair of the scalp is being shed, but these are incidents which only call for passing mention.

Somewhat more important is the fact that *gummata* develop in the eyelids and adjacent parts. They may grow to be as large as a hazelnut. In one instance, under my notice, such a tumor appeared in the skin over the lachrymal sac, and, months after the first tumor had disappeared, another occurred upon the border of the lower lid. These developments belong to the late stages of syphilis, the tertiary period; in the instance above alluded to, several years had elapsed since the first infection.

A mistake is not unlikely to be made in diagnosis of these cases, because cystic tumors, and less frequently fibrous tumors, are of common occurrence in the lids. They, like gummata, usually grow slowly and painlessly. But it is not always true that gummata grow slowly; they may attain considerable size in two weeks.

The skin is sometimes thickened, and raised above the surrounding level. The most important local guide in diagnosis is that the swelling involves all the tissues where it is located, and, as it were, incorporates them all into itself. This, in connection with its indolent, painless character, the possible discoloration of the skin, and the constitutional symptoms and history, will guard one against the error of attempting to apply the knife or other instruments to the removal of these tumors. Like other gummata, they melt away under a suitable course of constitutional treatment.

Drooping of the upper lid (ptosis) is caused by affection of the third nerve, and will be alluded to when speaking of paralysis of the motor nerves of the eyeball.

CONJUNCTIVA.—The kinds of inflammation which syphilis may cause in this membrane (meaning the ocular conjunctiva) are: First, sores from primary infection; second, mucous patches; and, third, gummy growths. The last belongs quite as much to the sub-conjunctival connective tissue as to the mucous membrane. All of the above lesions are rare. The most frequent is an ulceration which I have seen coexisting with mucous patches in the mouth. The common site is near the margin of the cornea, where a reddened and elevated spot appears, resembling a severe phlyctenula. It rises higher and is more extensive than such eruptions usually are, and it soon presents ulceration. The surface not only becomes excavated, but shows a jelly-like, semi-transparent tissue upon the eroded part—and this may spread to the cornea. The ragged, angry, irritated look of such an elevated ulcer, with the broad thickening of the base, and the large vessels running into it, its encroachment on the cornea, its slow recovery, the pain, lachrymation, and photophobia which attend it, mark the case as dependent on a constitutional vice. The search for corroborative symptoms of syphilis will usually be rewarded by success.

I have seen this lesion oftener in women than in men. The local remedies are: bathing the eye with lukewarm water for short periods, say fifteen minutes four or six times daily; the use of solution of sulphate of atropia, gr. ij ad ℥ j, dropped into the eye three to six times daily; protection against strong light by a shade or blue glasses, and the avoidance of remedies of an irritating quality. Besides these local means, the constitutional treatment should not be omitted; the only caution to be observed, being to have regard to the state of the general health, and if needful to exhibit tonics as preliminary to, or in connection with, the specific remedies. This caution is not unimportant, because very many of these patients will be found to be in a feeble or cachectic condition, and their diet must often be as carefully directed as their medication.

THE CORNEA.

In the preceding paragraph the occurrence of the ulceration of the cornea in mucous patches of the conjunctiva has been alluded to, and needs no further mention. I have not seen these ulcers go on to perforation.

Inflammation of the cornea, as the effect of *hereditary* syphilis, is a very common disease among children. It usually appears between six months and two years of age, while it may remain latent until the fifth year, or be seen as late as the fifteenth year. It is commonly preceded by cutaneous eruptions, especially about the buttocks, and by glandular swellings. Often the children have coryza, with swollen lips, flattened nasal bones, and badly-formed or perishable teeth. Mr. Hutchinson first called attention to the importance of the teeth as a diagnostic mark; that the incisors are notched or pointed, or very small, or crooked, or decayed. The canines as well as incisors may be abnormal. The general health is bad, and the whole nutrition perverted.

The disease is not violent in its onset. A slight congestion appears about the cornea, a little opacity upon its surface. There are moderate photophobia and pain, often no lachrymation. When the disease has deeply involved the corneal structure, the subjective symptoms become intense, and are often most distressing.

The alterations of tissue consist usually in opacity and vascularization. It is rare that ulceration, except of the minute superficial kind, or suppuration, occurs. The opacity, which at the beginning is faint, soon spreads over the whole surface, and into the depth of the cornea, and becomes more intense. It even affects the posterior epithelial surface, and, because of its extent, is commonly called keratitis diffusa. Of course sight is at once injured, and may be reduced to mere perception of light.

The disease may penetrate deeper into the eye, and involve both the iris and choroid. I have under observation a boy, now fourteen years old, who exhibits the effects of inflammation both of cornea and iris and ciliary body—the cornea mottled with diffused and spotted opacities, the pupil closed and adherent to the lens, the tissue of the iris atrophied so as to be translucent in many places, and the periphery of the iris drawn backward by contraction of exudation and its adherence to the ciliary processes.

The duration of these cases, under skillful treatment, is from one to three months when taken at an early period. But the continuance may be much longer if the disease have taken a severe hold before suitable treatment is undertaken. The prognosis as to vision will vary with the severity of the attack, but in general it may be considered favorable. The same disease may occur among adults, but is less frequent, and requires no special description.

The method of treatment must first have respect to the constitutional trouble. By this I mean rigorous attention to food, exercise, and bathing, as well as administration of mercurials. Food in easily-digestible form must be given in quantity and frequency which the stomach will permit; milk, beef-tea, chopped beef or mutton, either roasted or broiled, bread, and eggs, are to be the chief reliance, while sweets and fibrous vegetables are to be excluded. The child should be taken out-of-doors daily, with proper protection from the light by a veil, and a tepid bath should be given every other day. With these hygienic measures the tonic and specific treatment must be combined. It is often advisable to give cod-liver oil, sometimes quinine, or the syrup of the iodide of iron; while the readiest method of introducing mercury is by putting the blue ointment upon a flannel bandage which shall be swathed around the abdomen. The ointment must be renewed night and morning, and the skin carefully sponged with warm water to prevent it from becoming irritable. By this management no unpleasant effects take place and the influence of the remedy is seen in the gradual improvement of the health and appetite. The treatment of the eye consists in fomentation, by compresses wrung out of hot water, for a period of one hour or two hours at a time, three times daily. The compresses must be changed as fast as they become cool, and the water must be kept as hot as the hand can bear. This treatment is laborious, but is unequaled in efficacy; sometimes poultices may be more conveniently used. A solution of sulphate of atropia, gr. ij ad ℥ j, should be dropped into the eye three or six times daily.

As the photophobia and acute symptoms abate, the period of fomentation may be shortened, until with increasing amendment it may be stopped. It is well to keep up the atropia, so long as any hyperæmia remains. Inunction should be persisted in for about two months, unless contraindications forbid. If the skin become fretted, some other part of the body may be chosen for the ointment, or hydrargyrum cum cretâ in doses of five grains, administered three times daily. Usually the chief specific remedy demanded is some form of mercury, but in older subjects the iodide may also be required. The extreme importance of using specific remedies in these cases, as well as of guarding them as above indicated, cannot be too strongly insisted upon.

THE IRIS.

There are two affections of the iris which result from syphilis—paralysis of the sphincter of the pupil, causing *mydriasis*, and *inflammation.*

It is not necessary to say much upon *mydriasis.* It occurs under two conditions. In one case it is associated with evident paralysis, of one or more of the other twigs of the third pair of nerves. So that, besides dilatation of the pupil, there may be ptosis or divergent strabismus, or diplopia.

Another case in which mydriasis appears does not present any sign of lesion of the third nerve, so far as other twigs are concerned, but appears to be associated with obscure changes in the brain, or at the base of the skull, which may not at the time declare themselves by noticeable symptoms. Nothing definite can be predicated upon this fact, but it serves to awaken expectation of some disaster which may hereafter arise. It is also true that mydriasis is caused by irritation in the upper part of the spinal cord, or of the cervical sympathetic, and by causes wholly removed from syphilis. It is a common observation among the insane, and among those called merely nervous.

Furthermore, it must be stated that monocular mydriasis, without impairment of any of the other branches of the motor oculi, results from severe use of the eyes, and is attended by paralysis of the accommodation. This happens among miniature-painters, engravers, and such classes of workers.

While saying thus much, to guard against error, it must be added that monocular mydriasis occurs from syphilis, unconnected with either diplopia or ptosis. (For detail of such a case, *see* a paper by Méric, in the *British Medical Journal* for January 8, 1872, p. 29, and in the same paper are cases recorded in which mydriasis was combined with ptosis, all other branches of the third nerve remaining intact.)

As to the constitutional treatment of syphilitic mydriasis, nothing special need be said. For local treatment the contraction of the pupil may always be temporarily secured by putting between the lids a disk of gelatine charged with the extract of calabar bean. But the remedy has only a temporary effect, and cannot easily be graduated to answer a useful purpose. The faradic current is sometimes used, and Duchenne says he has had success by putting one pole on the sclera and another on the temple, but this treatment is not to be commended.

IRITIS.—The most frequent affection of the iris which syphilis produces is *inflammation*. It has been calculated that about fifty per cent. of all cases of iritis are due to syphilis.

The attack may occur within a few weeks or months after primary affection, or it may come among the later phenomena of the secondary stage. Although the contrary has been maintained, there are no marks in the iris by which the syphilitic origin of an inflammatory attack can be asserted. In other words, syphilitic iritis has the same symptoms as other forms of the disease.

The tendencies of syphilitic iritis are especially to the formation of plastic exudation, and, when this reaches the exuberance of gummy nodules, it is very rare that such a case is not caused by syphilis. On the other hand, iritis syphilitica may exhibit only serous effusion. The most frequent cases are those in which a moderate quantity of plastic matter is thrown out upon the pupillary border, and causes adhesions between it and the crystalline lens.

A brief enumeration of the symptoms of iritis is as follows: The pupil refuses to expand when the light is obscured, and is apt to be of small size; the iris-tissue is altered in color, and likewise indistinct in texture; the color of the pupil is smoky, and not jet black; perhaps the pupil is irregular, and at its margin may be seen black specks of exudation; the effect of a drop of a solution of atropia is either not to cause any expansion of the pupil, or to give it an irregular form, the margin being festooned; there is hyperæmia of the sclera and conjunctiva, in the immediate neighborhood of the cornea, whose depth and extent will vary with the severity of the attack; there may be chemosis; there is lachrymation; the lids do not open fully, and may be a little swollen; light is offensive; pain is seated in the eye, but more often upon the forehead and temple, or at the vertex and occiput, tracing the course of the supra-orbital branch of the fifth nerve; vision is always impaired, and sometimes is reduced to perception of light.

In serous iritis, the aqueous humor will be very dim, and so abundant as to make the anterior chamber unusually deep by pushing back the iris and lens. There are cases in which the whole anterior chamber is occupied by a semi-gelatinous substance, as if a thin and not well-clarified jelly had coagulated there. This mass sometimes presents such a similarity to a dislocated crystalline lens as to have been mistaken for it. It consists of exudation of a plastic quality diffused through the aqueous fluid. Its appearance when undergoing absorption is striking, because the lower part of the chamber will be murky and clouded, while the upper part will be comparatively clear and display the iris and some of the pupil.

In other cases plastic material exudes in nodules upon the free surface of the iris, presenting masses like mustard-seeds, or larger bodies, located upon any part of the membrane, but more commonly around the pupil. Sometimes this substance is so abundant as to be precipitated to the bottom of the anterior chamber as hypopyum. These masses are sometimes vascular, and their color is always a reddish yellow. They are correctly called gummata, and have been extracted and found to present under the microscope the features of true gummy exudation. This material, it must be understood, infiltrates the whole thickness of the iris, and its adhesion to the lens is consequently dense.

The reason for impairment or loss of sight is found in the turbidity of the aqueous humor, in deposits upon and proliferation of the epithelium of the posterior face of the cornea, and in the obstruction of the pupil. The reason why the pupil in the beginning of iritis is always small is, that the hyperæmia and swelling of the tissue compel the iris to push inward in the only direction in which it can find space. So far from the narrow pupil being due to contraction of the sphincter pupillæ, the muscular fibres are reluctant to act because of the sodden condition of the tissue. Inasmuch as a large part of the iris lies in contact normally with the crystalline lens, adhesion between the two surfaces is inevitable, and this is true even when the pupil is well dilated by atropia, as is illustrated in cases of serous iritis.

A true picture of iritis cannot be presented without bringing into view *complications* which often accompany it.

The minute opacities above alluded to, which are often found on the inner surface of the cornea, especially on its lower half, are in part precipitations, but also result from participation of the epithelium of the membrane of Descemet in the inflammatory process.

The ciliary body and choroid are still more frequently affected. The evidence of the fact is not easy to obtain in the early stages of the inflammation, but all obstinate and persistent cases of iritis pass over into irido-choroiditis. Especially is this true when the plastic exudation is copious, or when the pupil has not been dilated. In old cases the iris sometimes gets a greenish tint or a chocolate brown, its fibres look atrophied, none of the normal tracery can be made out, but a blur overspreads the surface, and hæmorrhages are apt to occur. The vitreous humor is hazy—the retina suffers, and often the eyeball becomes soft to the touch, or even reduced perceptibly in size. Vision in these complicated cases is extremely bad. The sclerotic hyperæmia may not be great, but is persistent, and the globe is both painful and acutely sensitive to pressure. Photophobia is often extreme. If complete posterior synechia be the result of iritis, it happens in course of time that an accumulation of fluid takes place between the iris and the suspensory ligament of the lens, which pushes the periphery of the iris forward and gives it the shape of a ring-cushion. As a result of this condition, the globe in time becomes hard, and secondary glaucoma with excavation of the optic nerve sets in. In such old cases the iris-tissue may have atrophied so much as to be semi-transparent, while its fibres show like the warp of muslin before the cross-threads are woven in.

In other badly-resulting cases, the iris is stuck fast to the lens-capsule so completely as to exhibit the convex outline of the lens and to present at its periphery an evident furrow. The attempt to take out a piece of iris in these cases often results in getting away only the front layer of the membrane, while its posterior, deeply-pigmented layer, sometimes erroneously called the uvea, remains adherent to the lens, and frustrates the operation.

The formation of a tough fibrous membrane across the pupil, and thickening of the anterior capsule of the lens, are consequences to be naturally looked for in badly-treated or severe cases; while, as a result of irido-choroiditis, cataract not seldom arises.

Iritis may attack both eyes, either in succession or simultaneously, yet is frequently confined to one eye.

The description above given applies to acquired syphilis, in its various stages, but iritis occurs as the effect of *hereditary syphilitic taint.*

It indeed may occur *in utero*, as is shown in clearly-developed symptoms of irido-choroiditis in new-born infants — the pupil completely shut by false membrane, the eyeball reduced in size, the color and texture of the iris abnormal. Hereditary syphilitic iritis usually develops in the early months or years of infancy. I am treating a child one year old, in whom, after the disappearance of an attack of keratitis, which was recognized as due to syphilitic taint, iritis began It was not attended by great external hyperæmia nor pain, there was very little lachrymation, no swelling of the lids, and moderate photophobia; but the iris was almost concealed from view by a patch of yellowish-white lymph, which occupied all the anterior chamber, except at the upper outer third. The aqueous humor was so turbid, and the iris so discolored, as to look nearly black. The globe was hard, and the appearance of this patch at first suggested a chronic choroido-iritis, instead of an acute attack. This in reality is a sample of gummy exudation, precisely like this form of iritis in adults.

Such cases are uncommon, but have been noted by writers. They yield to suitable treatment, but great injury to sight usually remains.

The *prognosis* in iritis depends on the amount of lesion which has been inflicted at the time when treatment is begun. Firm and extensive attachments to the lens, and implication of the choroid, prolong the disease, and do more or less injury to sight. Success in dilating the pupil is speedily followed by abatement of symptoms. A very large proportion of cases of iritis, under early and judicious treatment, make a recovery in all respects perfect.

Treatment.—This is naturally divided into local and constitutional, and the former is by far the more important. The first and indispensable object of local treatment is to secure full dilatation of the pupil: measures to control hyperæmia are next in order; and, finally, remedies to relieve pain.

Under the first head the only effective substance is sulphate of atropia. It has entirely put aside the extract of belladonna, and in only a few exceptional cases does it produce conjunctival irritation, and must be substituted by the alkaloid of stramonium, viz., daturine. The strength of the solution of sulphate of atropia usually prescribed is gr. ij ad ℥ j. It should be ordered in such frequent repetitions as the obstinacy of the adhesions shall compel. Sometimes the instillation of three drops, three times daily, will tear some or all of the adhesions; frequently the same quantity must be repeated six times daily. In obstinate cases the solution may be ordered four times within an hour, three times daily, making twelve applications. When the pupil fails to yield to such solicitations, the effect of atropia will often be enhanced by leeches to the temple, say three to six at a time.

When the pupil begins to dilate, the inflammatory symptoms usually decline; especially is this true of pain. The energy with which atropia is employed is the peculiarity of the modern treatment of iritis, and is the chief ground of success. A word of caution must be interposed as to the liability of bringing on symptoms of poisoning. This effect is not very rare. The patient finds his fauces extremely dry, and, on inspection, their surface will be found congested and a little œdematous, the pulse is quickened, a mild delirium appears, and, in advanced toxic conditions, violent delirium and dangerous prostration will ensue. All this results from absorption of the atropia into the general circulation. Some persons experience unpleasant effects of this kind very easily.

If the pupil do not expand, even if aided by the application of leeches, I have sometimes resorted to the expedient of procuring a rapid but mild salivation by mercurial remedies, and found that, when the gums were touched, the pupil either yielded to the mydriatic, or the inflammation began to subside without expansion of the pupil. If it should not be deemed wise to employ this treatment, because of the feeble state of the patient's health, the operation of iridectomy is sometimes advisable. It is not fitted to the early states, but rather to the later period of a tedious inflammation.

The removal of hyperæmia often ensues when full mydriasis is obtained; but, if this be not so, leeches may be applied to the temple near the hair; three to six may be used, and may in some cases need repetition. Care should be observed not to be too free in depleting weakly subjects, and leeches must be regarded as having only a subordinate value. A mild pugative is often needful.

Relief of pain is an important item in treatment. Hypodermic injection of morphia may be needed to procure sleep, because it is at night that pain in the eye and head is most troublesome. Moderate degrees of pain are relieved by instructing the patient to rub the forehead with a mixture of extract of belladonna and powdered opium and mercurial ointment. A more efficient topical anodyne is the oleate of morphia (Squibb's), applied with a pencil and allowed to dry into the skin of the forehead and temple. The tincture of iodine applied with a brush is sometimes effectual. So, too, it is often a comfort to heat a folded napkin and press it against the forehead. Wet compresses, if of any use, should at the onset be cold, and in the latter stages be lukewarm. In a case of protracted iritis, the prolonged use of slippery-elm poultices is of the utmost benefit. They may be applied for two hours at a time, three times a day if necessary. The eye must be guarded against excessive light by blue or smoked glasses, although rigorous confinement to a dark room is not good practice, because of its weakening influence on the health. It will be found that feeble and cachectic subjects are more difficult to cure than the robust. If only one eye is involved, the patient should not use the other in any fine work. Exposures to the wind, and smoking, are to be avoided, and no attempt made to use the eye on near objects.

The question of *constitutional treatment* is important to be settled. In former times it was assigned the chief part in the cure. By some, at the present day, it is almost ignored.

I have seen a very large number, and, indeed, the majority, of cases of syphilitic iritis recover without being subjected to any of the so-called specific remedies. As above remarked, the facility of cure depends most upon the readiness with which the pupil expands, and can be kept open.

I have also said that sometimes the mercurial treatment will bring about prompt resolution when mydriatics fail. I must also say that where the plastic exudation is in large quantity, as when the so-called gummata make their appearance, mercurial inunction, or blue-pill by the mouth, may wisely be employed to aid in the disappearance of the exudation. I have seen entire absorption take place without this remedy, and in feeble patients would be unwilling to use it, but would give the vigorous the benefit of it.

I have no hesitation in stating that the usefulness of either mercury or iodine to cure iritis is exceptional and not the rule.

On the other hand, I must with equal readiness admit that specific constitutional treatment ought to be employed to counteract the poison whose potent influence has induced the iritis. This treatment is aimed at the general disease, and is to be selected and adapted according to the rules which are set forth in another part of this treatise. According to this view of the question, a practitioner is not compelled to dose a syphilitic patient with mercurials to protect his sight from the mischiefs of iritis, except under conditions specified, but should steadfastly adhere to that plan of treatment which the general welfare of the system demands, and attack the eye-disease with the local remedies which have been designated.

I have several times observed patients having iritis in one eye, who have already been brought under the influence of mercury, to be attacked with the same inflammation in the other. This certainly proves that no preventive virtue can be ascribed to the mercury, and argues against the beneficial influence of quick mercurialization in curing the acute attack.

In addition to the above remarks on treatment, I should speak of certain peculiar conditions calling for special measures. In cases of iritis serosa, where there is but little plastic exudation, the pupil will dilate readily, but often the pain and redness do not abate. On testing by the finger, the eye will be found to be tense and the anterior chamber will be seen to be too deep. Under these circumstances, paracentesis by a broad needle or a Graefe's cataract-knife is indicated. It is not necessary to draw off all the aqueous humor, but the proceeding may need several repetitions, as indicated by the recurrence of pain. The place of puncture should be at the margin of the cornea, the instrument should have a very sharp point, and be entered in a plane parallel to the surface of the iris. It should be withdrawn slowly, because a rapid gush of aqueous humor causes severe pain.

If, after an attack of iritis has passed away, the pupil should be tied down to the lens by extensive adhesions, relapses of inflammation are likely to occur, and the morbid process is prone to penetrate to the ciliary body and choroid. Hence arise opacities in the vitreous humor and in the crystalline lens.

The area of the pupil is sometimes overlaid by a false membrane and the capsule of the lens may undergo thickening.

If posterior synechia is complete, that is, if all of the pupillary edge be glued to the lens, an accumulation of aqueous humor sometimes takes place behind the iris, which makes it bulge forward toward the cornea in a series of protuberances or as a complete ring, leaving the pupil retracted. The peripheral parts of the iris sometimes come into actual contact with the posterior surface of the cornea, and the tissue always undergoes atrophy. So great sometimes is the waste of the tissue that in spots it becomes an open mesh-work of fibres through which the light of the ophthalmoscope can be thrown. This has already been alluded to. On the other hand, after iritis, the membrane sometimes becomes greatly thickened by formation of new tissue both in its stroma and on the posterior surface.

The remedy for the conditions of adhesion and obstruction is iridectomy. Its efficacy will, however, be in the inverse ratio to the severity of the lesion. In the worst cases, especially in those last described, it is sometimes scarcely possible to be performed, and seldom, if done, is of much service. Where the iris is turgid with new vessels, the operation is attended by great bleeding, and no good, but rather harm to the eye, may ensue.

In spite, however, of these drawbacks, this operation offers the only chance to rescue the eye from serious and cumulative mischief, and may be the only means of avoiding the necessity of extirpating the organ.

For cases of moderate posterior synechia it may be needless to do any thing, or the simple pulling away of the attachments by a fine pair of forceps will suffice. This proceeding is attended by only slight reaction, and requires a small wound at the border of the cornea—the iris when seized is pulled upon until the adhesion breaks, and is then let go, without being dragged into the wound. The forceps employed should not have teeth. This operation, suggested by Passavant, is preferable to other methods of detaching the pupil, such as that devised by Streatfield.

VITREOUS HUMOR.

A common effect of inflammation of the iris and ciliary body and choroid is the production of opacities in the corpus vitreum. They are either effusions from the surrounding vascular tissues or proliferations and degenerations of the cells of the vitreous. The anterior part of the mass is most frequently thus affected. The opacities present every variety of form, as molecules, fibres, tangled nets, flakes, and membranes. They sometimes develop rapidly, more frequently occur slowly. A noteworthy instance of rapid development is the following: Lieutenant D—— had hard chancre in March, 1872. In the following September, double iritis took place, and disappeared in four weeks, leaving a few adhesions of the pupil of one eye. Vision in the right eye was $\frac{20}{20}$; in the other, $\frac{20}{30}$. In June, 1873—about eight months afterward—a sudden development of opacities occurred in the vitreous of the left eye, totally abolishing vision, but leaving perception of light. No external hyperæmia of the globe existed—the fundus could not be discerned. The appearance of the vitreous was like that of a tumbler filled with muddy water, in which a quantity of torn and broken leaves are floating. He had been under mercurial treatment, both at the time when the chancre appeared and during the attack of iritis; in the last instance it was maintained for three months. When the acute hyalitis appeared he was directed to take a wine-glass full of Zittman's decoction three times daily, and by a life of regulated exercise in the country to keep his general health in the best condition. After six weeks the vitreous became so clear that the fundus could be perfectly examined. No lesions of the choroid could anywhere be found, and vision was restored to $\frac{20}{30}$. The other eye was not affected.

A case precisely like the above is not often observed, but a process slower in development and less in degree is a not rare effect of syphilitic poison.

It usually requires a long time for vitreous opacities to clear up—generally some of them remain permanently.

THE CRYSTALLINE LENS is, so far as I know, never the seat of syphilitic changes, excepting as they ensue in the course of inflammations of the choroid, the ciliary body, or the iris. More especially from chronic cyclitis and choroiditis does the nutrition of the lens become impaired and its transparency become damaged. In other words, it is changed into a cataract. The transformation of the lens-fibres begins in the deeper or posterior layers very often, and the lens when wholly opaque is either of a dead white or yellow tint, or becomes, in old cases, completely calcified. As a result of iritis, the anterior capsule sometimes presents opacities in the pupillary space, by proliferation of the epithelium of its posterior surface.

No good is gained in the attempt to cure opacities of the lens or its capsule by anti-syphilitic medication. The case will admit of nothing but surgical treatment, and in all cases the encouragement for success is dependent on the degree to which the integrity of the deep tissues has been preserved. It is always imperative to make a rigid investigation of the degree of perception of light, and the limits of the field of vision. Only by so doing can a patient be secured against the pain and disappointment of a needless operation.

The operation for cataract under these circumstances is always complicated, and may be quite difficult. For a discussion of this subject it is proper to refer to treatises devoted to diseases of the eye, while it is right to add that the probabilities of success in this class of cases are not encouraging.

THE CILIARY BODY.

I should not make special mention of inflammation of this part of the uveal tract, were it not that certain acute lesions of this tissue sometimes present themselves which have very striking features. It is the most highly vascular structure of the eye, and of necessity participates in the inflammatory changes of the iris and choroid. But it is entirely hidden from direct inspection, either by the naked eye or by the ophthalmoscope. I have before alluded to a state of retraction of the periphery of the iris which indicates adhesion between it and the ciliary processes. So far as superficial vessels may indicate the existence of cyclitis, the same kind of hyperæmia appears as when the iris is inflamed; that is, the anterior ciliary vessels become engorged.

Cyclitis, as an independent affection with unmistakable features, has appeared to me under two forms. In one there are no other symptoms than circum-corneal injection, and a little discoloration of the iris, without impairment of the action of the pupil; the vision may be dim. In the other and more important form, the inflammation presents gummy exudation more or less conspicuous. I shall speak only of the latter condition, and by relating the following case:

CASE LII.—A man about thirty-two years of age, had had syphilitic symptoms about four years; had had iritis. A few weeks before I saw him, sudden blindness fell upon his left eye, without pain, irritation, or visible redness. He was able to perceive only an intense light. The globe was not hard or tender to touch. The pupil dilated fairly by atropine, and no illumination of the bottom of the eye could be obtained by the ophthalmoscope. The vitreous simply gave back an inky hue. As the eye turned in various directions, a white object suddenly flashed across the field, in most instances starting from the inferior part of the globe. It was evidently close behind the lens, and never retired to the depths of the eye. When he looked strongly downward, a white patch was discovered close to the border of the crystalline lens, situated in the ciliary body, or its near neighborhood. This had the look of plastic exudation. The nature of the disease was then assumed to be, a plastic cyclitis, with a localized exudation not very abundant, from which a mass had been broken off, and floated about in the anterior part of the vitreous. The general opacity would be the necessary accompaniment of this condition. The patient had been treated by specific remedies, and they were again prescribed, but, after a period of two months, no improvement was obtained in vision, and the exudation had scarcely altered its appearance. There was never any visible hyperæmia nor pain.

In other cases plastic cyclitis appears in a much more formidable way. In addition to the pain, swelling of the lids, and vascularity, characteristic of a severe attack of inflammation of the globe, a swelling soon begins to arise at some portion of the eye near the cornea. The spot on which it springs may be more intensely red than other situations, and the locality where I have most often seen it is at the upper part of the eyeball. The tumor grows rapidly, and within a week I have seen it become larger than a buck-shot, its base occupying nearly one-fourth the circumference of this part of the globe.

There is always severe iritis, the pupil is totally obscure to the ophthalmoscope, and the anterior chamber filled with turbid aqueous humor. The disease occupies several weeks in its course, and the tumor will entirely disappear. Sometimes its site is marked by a dark-bluish discoloration. Sometimes the eye becomes soft and slightly reduced in size, but this is not a uniform result. In no instance have I seen any vision restored. It is not needful to dwell upon the subject of treatment, because the measures suitable to a similar process in the iris would be indicated. In two cases I have been obliged to extirpate the eye, because of the severity of the pain.

THE CHOROIDEA.

The frequent participation of this membrane, in the inflammations of the iris, has been repeatedly alluded to, and need not be further mentioned.

The similarity in structure of the two tissues causes a great resemblance in their morbid processes, but in many instances it becomes impossible to see the changes which occur in the choroid, because the pupil and refractive media become so soon and so deeply clouded. A form of choroiditis which may take place without affection of the iris, and without visible hyperæmia of the globe, is known by the name of acute choroiditis disseminata. Illuminated by the ophthalmoscope, the vitreous will be faintly hazy, but through it will be discerned a number of small isolated specks of a light-yellow color upon the posterior wall of the eye. These specks are more apt to exist near the equator, but may appear upon the central part of the fundus. They are seldom bigger than one-fourth the area of the optic nerve, often are much smaller. They show an unmistakable elevation, and in some instances a retinal vessel may be seen to pass over them. The optic nerve is always hyperæmic, but doos not show infiltration. None of the choroidal stroma appears clear, so far as the degree of pigmentation natural to the individual will permit a judgment.

These spots of exudation are sufficiently characteristic to secure an easy recognition of the disease, and they suggest the features of iritis gummosa. The picture thus sketched, after two or three weeks, begins to undergo alterations. The yellow specks grow fainter, but an aggregation of pigment takes place at the border of the deposit. After a time, with its more complete disappearance, the place it occupied in the choroid is found to have become thin by the destruction of the epithelium; and finally the stroma of the membrane is absorbed, leaving only a dead-white patch, whose border is deeply marked by black pigment. In old and severe cases the aspect of the interior of the eye is most striking. Circular, oval, and rounded white spots with black edges, are clustered thickly over the surface, presenting a brilliant contrast to the red color of the choroid, while upon the apparently normal surface pigment-dots are strewed about to give evidence of the extension of the disease over all the tissue. There may also be light-colored red patches, which indicate thinning of the membrane. As above said, these lesions are greatest around the periphery of the choroid, and leave the central and more highly-organized part of the fundus less impaired. But vision is always very badly reduced, and may be entirely lost. I have seen cases in which the above-described atrophy had spread over large spaces, leaving only a few of the greater choroidal vessels as vestiges of the vascular tissue. The progress of the above lesions may be completed in a few months, and the efficacy of treatment is only moderately satisfactory.

Another form of choroiditis which is seen in syphilitic patients consists in the formation of patches of atrophy at the peripheral part of the fundus without previous deposit of lymph. The wasting of the membrane is a gradual process, and the patches will present a mixture of white, bordering upon a light-red surface, and the whole bounded by a dark pigment-line. The light-red part of the patch indicates that here a portion of the membrane yet survives. These patches take on most irregular forms and may attain large size. They exhibit the most varied mixture of black and red and white, because of the diverse degree to which the choroid is destroyed, and the irregular deposit of pigment, both around and upon the patches. They are very chronic in their development, and may sometimes be discovered in an eye which the patient supposes to be perfectly sound. Indeed, direct vision may be normal, but the visual field must be encroached upon.

It is just to state that this kind of lesion is also found in persons who give no evidences of syphilis. The only attainable success of treatment in these cases is to delay or arrest the advance of the disease. I have never, however, convinced myself that a complete arrest has been secured. The difficulty of following up patients suffering from such a chronic disease will be readily appreciated. Several years must pass before a certain conclusion could be reached.

In the first-described cases a somewhat active treatment would be proper in the exudative stage; that is, the artificial leech should be applied to the temple to remove from two to three ounces of blood, and the patient be kept for twenty-four hours afterward in a dark room. This may be repeated, according to the strength of the patient, in five or ten days. Dark-blue glasses (*coquilles*) should be worn. The bowels should be mildly acted upon. The constitutional treatment for syphilis should be pushed with as much energy as the tone of the system will bear. Most authors urge a speedy mercurialization, but the same discretion is imperative as in all other cases of syphilitic lesion. The health of the retina is not more likely to survive the evil effects of overdosing with mercury than of the taint of syphilis.

In the choroiditis last described only the slow and milder methods of constitutional treatment are appropriate. Local treatment, beyond protection against excessive light, and moderation in the use of the eyes, is of little value.

RETINITIS.

When produced by syphilis, retinitis exhibits only a slight haziness and œdema of the retina, with lack of sharpness in the outline of the vessels and of the optic disk, and hyperæmia both of the retinal vessels and of the optic nerve. The deeper part of the vitreous is hazy. The optic nerve is not swollen, there is very little radiate striation of the retina near the nerve; there are no ecchymoses and no thick plaques of yellowish-white exudation. The peripheral part of the retina may remain free from perceptible change, and not only is the disease usually confined to the central region of the retina, including the nerve, but it sometimes is more narrowly localized to the vicinity of the yellow spot itself.

Because it is thus inconspicuous, this inflammation is, on the one hand, liable to be overlooked, and, on the other hand, to be confounded with such troubles as faint haziness of the vitreous, or of the cornea, or perhaps of the lens. Indeed, I have had a case of slight astigmatism of the mixed variety, which, because there had been a syphilitic history, I for a time mistook for retinitis. The way to escape such errors is by careful refractive adjustment with the upright image to the several parts and depths of the dioptric media. Examination with the inverted ophthalmoscopic image will fail to assure a diagnosis.

This kind of inflammation may attack one or both eyes, and may pass from one to the other. It may last a very short time, say for three or four weeks, or it may persist for several months. It does not always, but may sometimes, cause lasting harm to sight. In both the transient and the obstinate cases it shows a disposition to recur. The subjective symptoms consist of occasional flashes of light at the beginning of the disease, and subsequent dimness of sight; there is no pain nor lachrymation, and but little photophobia. There is no external hyperæmia.

Treatment never needs to be energetic: protection against bright light by colored glasses, abstinence from use of the eyes, the artificial leech, according to the usual rules, two to four times, at intervals of a week, constitute the local treatment which can be of much avail. The chief reliance is in the constitutional treatment, according to the principles before enunciated.

NEURITIS OPTICA.

This is of two varieties: 1. That which is primarily in the outer and orbital extremity of the nerve; and, 2. That which is set up by intracranial causes. In both cases the retina may be more or less implicated. The distinction between the two classes of cases cannot be made with any certainty by the ophthalmoscope alone, but the question of intra- or extra-cranial origin of the lesion always presses for solution. The *symptoms* which appear vary according to the quality of the inflammation and according to its stage: 1. In simple cases nothing is seen but redness of the nerve surface, and a little fullness of the central vessels, with scarcely any blur of the edge or of the tissue. 2. In other cases the nerve is swollen to an extreme degree, its structure infiltrated and opaque, often striated, its color red or gray or leaden, its border partially or wholly obliterated, its vessels tortuous and turgid. The aspect is then that of the so-called "choked disk," and its cause is usually intra-cranial. A typical case of this kind has just come to my notice in a man lying in Bellevue Hospital with manifest brain-disease, as denoted by the partial coma and delirium, the headache, the tenderness of the skull on pressure, and the evident periosteal swellings of the forehead and vertex. Both optic nerves are in the condition described, and he has the history of syphilis—a gummy tumor in the substance of the brain, or basilar meningitis, may cause the same result. 3. In other cases of brain-syphilis the optic nerves become impaired, and exhibit to inspection only a white color and woolly texture with a little blur of the edge—the vessels being small. There may perhaps be a doubt whether a faint degree of hyperæmia has not preceded this condition—but, if it has, its duration has been extremely brief. The look which the nerve in these cases possesses is difficult to describe, because the change is in texture.

In these cases, as well as in the nerve-lesions before mentioned, it is extremely important to determine the extent of the field of vision. It will be found in almost all instances to be curtailed at some part. Very common is it, to find irregular hemiopia or the loss of a quadrant of the field—concentric limitation is not so common.

Prognosis in these affections is never good, but a valuable degree of sight is often preserved or recovered.

Treatment is mainly constitutional.

AFFECTIONS OF THE ORBITAL MOTOR NERVES.

An extremely common effect of syphilis is to disturb the function of some of the motor nerves of the eye; one muscle, or any number of the muscles, may be paralyzed. Inasmuch as the third (motor communis oculi) supplies four muscles, the eye, when it is impaired, is most helpless; but separate twigs may be singled out while others are undisturbed. If the whole nerve is at fault, the eye stands at the outer angle, is incapable of motion up or down, and cannot turn inward farther than the median line; the upper lid droops and cannot be lifted. It can be carried more outward by the external rectus, and under influence of the superior oblique will make some rotatory movements. The pupil will be in medium dilatation and the function of accommodation paralyzed. Diplopia will not commonly be noticed, even if the lids be opened, because the two images are so far asunder as not to attract attention. As the nerve begins to recover and the eye to regain mobility, diplopia will become annoying and the images will be crossed.

If the sixth nerve is paralyzed, the eye stands in abnormal convergence, because the abductive power of the external rectus is destroyed. Double images then are correspondent (homonymous), and are most an noying for distant objects, while an object brought very near the eye may be seen correctly. If the fourth nerve is paralyzed a superficial inspection may fail to recognize the defect in mobility. It will be detected with certainty by careful study of the double images. To do this it is better to take a lighted candle for an object, and to put a slip of red glass before one eye. There may be no diplopia in the field above the horizontal line, but, as the eyes descend, double vision occurs, one image (the false one) being below the other, and, as the object is carried to the temporal side of the affected eye, the images, besides being above one another, separate laterally, the false one being farther to the nasal side. Another fact about the false image is, that it is not vertical, but leans so that its top inclines inward. Without study of the double images, a strong suspicion of paralysis of the fourth nerve may be awakened by noticing that the eyeball when caused to move in a straight line below and parallel to the horizon, in reaching the middle of the orbit in its excursion outward, makes a twitch and an imperfect rotation of the cornea, and also fails to go as easily and completely to the outer angle as the healthy eye.

Patients who, from any kind of paralysis, have diplopia, are thereby much disturbed, sometimes having nausea and headache, while, to use their eyes, they must either shut one, or correct the double sight by some twist of the head, or by means of properly-adjusted prisms. The use and choice of prisms is a subject not suited to the present treatise, and for which the reader is referred to the works on ophthalmology, e. g., *vide* Wells on "Diseases of the Eye."

During the early stages of the trouble, the proper treatment is counter-irritation to the temples, the faradic electric current, and constitutional remedies. After a number of months have passed, if some imperfection of motion remain, the use of prisms, or the performance of tenotomy, or of some operation on the muscles, may be resorted to.

PERIOSTEAL INFLAMMATION of the orbit does not often occur, but some symptoms which it causes are worth attention. If it affect the deep parts of the cavity, it may cause disturbance in the function of some of the muscles, and hence diplopia; or, if attended by serous or other effusion in sufficient quantity, may produce exophthalmus, and visible signs of inflammation in the globe and eyelids.

This I have seen, in the most emphatic character, in a case where the anterior part of the orbit was the seat of periostitis. So great was the congestion, œdema, and secretion from the conjunctiva, and the swelling of the lids, that the disease resembled acute purulent conjunctivitis. The pain which the patient suffered was intense, and greater than is common in conjunctival inflammations. This fact, and the presence of an eruption on the face, led to digital exploration of the margin of the orbit. The exquisite tenderness at once revealed the true nature of the diseased action, and indicated the need of constitutional as well as of local treatment. After one eye had suffered in this way between two and three weeks, the other was similarly though less severely attacked, and in this instance the onset of the trouble was distinctly seen to be in the lining membrane of the orbit, and from it acute inflammation was propagated to the external structures of the globe. There was no evidence of gummy exudation. The treatment of the case consisted in leeches to the temples, iced-water compresses changed so often as to be constantly cold, application of a solution of nitrate of silver—ten grains to the ounce—to the everted palpebral conjunctiva, at first twice and afterward once daily, and hypodermic injections of sulphate of morphia: besides this, very high doses of iodide of potassium, at one time reaching three drachms a day, were employed, but the benefit derived from the heroic doses did not appear to be great. The patient recovered without damage to her eyes.

As to gummy tumors growing in the orbit, nothing special need be said: that their bulk must displace the eyeball, and that they must otherwise interfere with its functions, is self-evident.

CHAPTER IX.

SYPHILIS OF THE EAR.

Syphilis as affecting the External, Middle, and Internal Ear.

THE affections of the ear, caused or modified by syphilis, are conveniently considered by arranging them, in accordance with the anatomy of the organ, into those of the external, middle, and internal ear.

The integument of the *external ear* is liable to be involved in the cutaneous affections of syphilis, its substance to be destroyed, or its cartilage eaten away by syphilitic ulcers and gummy tumors. The auditory canal may be invaded by mucous patches, sometimes showing exuberant granulations, by erythematous spots, or by pustules. A dry exfoliation of portions of its skin is not uncommon, together with a change in the quality of the sebaceous matter, so that the latter accumulates in a scabby way over the drum-head, perhaps causing partial deafness. The cerumen may also become impacted. Bony growths—exostoses and hyperostoses—in the external auditory canal may also be encountered in the course of syphilis, but Roosa[1] believes that these growths occur quite as commonly as the result of local irritation in persons who have never had syphilis.

The middle ear may be involved, in the course of secondary disease, by an inflammation of its lining membrane. This inflammation is not attended by increase of secretion (catarrh of the middle ear), but by a proliferation of tissue, which does not tend to suppuration but to thickening of the drum-head, and to adhesions between the ossicula and the walls of the tympanum. Wilde[1] described this affection under the name of "syphilitic myringitis," and he believed that it was characterized by the relative insignificance of the pain, in comparison with that felt in the same disease when not due to syphilis. Bumstead,[2] however, thinks that the absence of local pain is not a characteristic of the malady. Roosa[3] believes that there are no peculiar aural symptoms in this form of disease. He remarks, however, that "a syphilitic diathesis seems to cause the proliferation of tissue to be more rapid." He agrees with Schwartze, of Halle, who thinks that periostitis of the middle ear is at the basis of these cases.

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[1] "Diseases of the Ear," p. 402.

Local bloodletting, the warm douche, and opium for pain, will, with the ordinary anti-syphilitic treatment, usually master the affection, if employed during the early stages. It will probably also be necessary to inflate the ear by Politzer's method, in order to prevent the formation of adhesions in the tympanic cavities.

Young children affected with congenital syphilis may be attacked by a catarrh of the middle ear, which resists local and constitutional treatment, very obstinately—that is to say, intra-auricular adhesions occur, the drum-head becomes sunken, the nerve is secondarily involved, and the impairment of hearing often remains permanent.[4] The mouth of the Eustachian tube is sometimes, but rarely, the seat of ulceration, and thus impairment of the hearing may be caused. Permanent loss of hearing is sometimes due to cicatrization of the pharyngeal orifice of the tube.

The portio mollis of the seventh pair may be the seat of special disease, and periostitis of the labyrinth, as well as gummy tumors, may occur. The results of treatment of syphilitic disease of the labyrinth or nerve are often unsatisfactory. The use of the tuning-fork will be an efficient aid in the differential diagnosis of cases in which there is doubt as to whether the loss of hearing depends upon disease of the middle or internal ear. If the middle ear be affected, the sound of a tuning-fork, the handle of which, while the instrument is in vibration, has been placed upon the forehead or teeth of the patient, will be intensified in the diseased ear; while, if the internal ear be the seat of disease, the intensity of sound will be much diminished, or the vibrations will not be at all perceived on the affected side.

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[1] "Aural Surgery," English edition, p. 260.

[2] "Venereal Diseases," p. 590.

[3] *Loc. cit.*, p. 286.

[4] Roosa, *loc. cit.*

CHAPTER X.

SYPHILIS OF SPECIAL TISSUES AND ORGANS.

Syphilis of the Nails.—Dactylitis.—Syphilis of Tendons, Sheaths of Tendons and Aponeuroses.—Syphilis of Muscle.—Syphilis of Joints.—Syphilis of Bone.—Syphilis of Cartilage.—Syphilis of Lymphatic Glands.—Syphilis of the Mammary Gland.

SYPHILIS OF THE NAILS.—Mucous patches are sometimes seen under the free border of the nail. A whitish or brownish, badly-smelling, characteristic secretion, is furnished by such patches. With the earlier eruptions on the skin, the nails are liable to lose something of their lustre. They are apt to become seamed by slight longitudinal furrows, brittle, friable, cracked, and shaling off at their extremities, sprinkled with an abundance of white points showing an imperfect epithelial formation. This dry form of onychia may cease at any period of its progress, healthy nail growing out from the matrix, or it may go on, very rarely, to a complete shedding of the nail. Instead of these changes, occasionally the nail becomes thickened, rough, discolored (Fournier).[1]

ONYCHIA.—During the secondary period of syphilis, specific onychia is sometimes encountered upon the fingers, more often upon the toes. It is not uncommonly symmetrical, the same toe on each foot being involved. Spontaneously, or after slight injury, pain is felt somewhere about the border of the nail. The painful point becomes swollen and of a reddish-brown color. This goes on to ulceration at the edge of the nail, and spreads around it. The surface of the ulcer is moist, brownish, fungous; the secretion ichorous, fetid. The nail loosens, superficial ulceration progresses beneath it. The nail, with the progress of the affection, sometimes softens and falls away, its place being supplied by the ulcer, only a small portion of nail remaining at the point occupied by the lunula. The whole end of the toe or finger becomes engorged, violet-colored, very painful; deep inflammation, with necrosis of the ungual phalanx, may follow. Instead of reaching this extreme, the affection sometimes remains confined to a portion of the circumference of the nail. Here the skin is swollen, livid, ulcerated; the nail seeming to act like a foreign body, preventing repair. All the forms of syphilitic onychia progress very slowly, but terminate habitually in recovery.

Diagnosis.—The dry form of secondary syphilitic onychia must be distinguished from the somewhat similar condition found in eczema, psoriasis, and parasitic affections, by the history and concomitant symptoms. The ulcerated form of secondary onychia is distinguished from ordinary in-growing nail, run-round, etc., by this, that in it, ulceration and inflammation take place primarily in the matrix of the nail, while in the latter affection it commences first in the outlying tissues. Tertiary onychia is a gummy, destructive inflammation of the matrix in a more severe form. It has the same general characters as the secondary affection, only more severely. It usually commences in the matrix, at some point along the lunula, the nail thickens and softens, finally falls, while destructive ulceration is slowly advancing, involving the deeper tissues in an irregular manner, perhaps attacking the bone.

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[1] *American Journal of Dermatology and Syphilography*, 1873, translation.

Treatment.—The constitutional treatment is regulated accordingly as the disease partakes more of the secondary or tertiary type. Locally cleanliness, removal of nail and loosened portions of nail which act as foreign bodies, nitrate of silver for exuberant granulations, iodoform pure or diluted for ulcerated surfaces, or black or mild yellow-wash.

SYPHILIS OF THE FINGERS AND TOES.

DACTYLITIS (δάκτυλος, *a digit*—finger or toe).—This rare affection requires a special description. But few cases of it are on record.[1]

Dactylitis is gummy in character, and hence belongs to the later stages of syphilis. Taylor makes two varieties:

1. Subcutaneous and articular, the bone not being much affected.
2. Nearly confined to the bone and joint.

1. The first form comes on rapidly or slowly, diffuse gummy infiltration takes place subcutaneously, involving the periosteum upon the first phalanx (most often), but perhaps including the whole fingers. The swelling usually terminates abruptly, as a more or less perfect ridge at the articulation of the finger or toe with the hand or foot, and is most marked on the dorsum. The swelling is sometimes very great, so as mechanically to impede motion, but there is no complaint of pain. The skin is natural or slightly bluish, from venous obstruction. The swelling is firm, resistant to the touch. The fibrous structures around the joint next become also involved. The synovial membrane seems to escape, there being no effusion into the joint unless the bone is also implicated. After a variable time crepitation (rather rough) may be observed in the joint. Disintegration of the joint is possible, the skin ulcerating over it. The bones, especially near the affected joint, also enlarge slightly, participating in the disease. The malady runs a slow course, perhaps relapsing several times after apparent efforts at repair, but yields in the long-run to specific remedies, leaving behind more or less disturb-

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[1] Its whole history, clinical as well as literary, is comprised in a recent able paper by R. W. Taylor, of New York, published in the *American Journal of Dermatology and Syphilography*, January, 1871. Dr. Taylor's essay is based upon two new cases of the disease.

ance about the function of the joint, according to the degree to which the disorganization of its tissues has progressed. In bad cases anchylosis would follows.

2. In the second form, the phalanx, usually the first, is primarily attacked in its bone as a gummy osteo-periostitis, or an interstitial gummy osteo-myelitis.[1]

The swelling is sometimes very considerable. In Berg's[2] case the finger had a circumference of five inches (Fig. 133).

In this second class of casses the swelling is mainly confined to the phalanx (most markedly its dorsal surface), and to the joint affected, as there seems to be little, sometimes no disease of the more superficial structures. The affection may run an acute or a chronic course. The integument becomes stretched and tense by the subjacent swelling. Its color grows pink or red, and it may be for a time sensitive, the result of continued pressure. The nail does not suffer, even when the last phalanx is involved. Appearances similar to those found in dry caries have been encountered after death in the affected phalanges. The gummy deposit, after producing great swelling of the bone by its infiltration, undergoes absorption without suppuration, as in dry caries, and results in loss of substance of the bone, which is not replaced by new tissue. If very rapidly formed, the gummy deposit, here as elsewhere, may undoubtedly break down, and be eliminated externally. In this second form of the disease, changes sometimes occur in the joint similar to those already described for the first variety. Considerable effusion may take place. The amount of pain complained of is very slight, as in other syphilitic joint-affections.

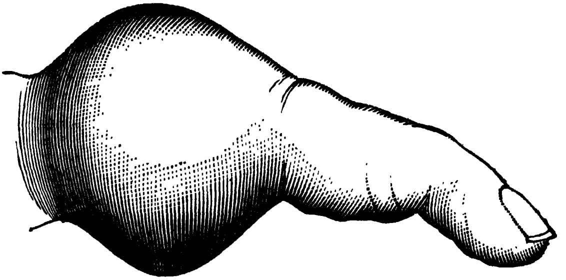

FIG. 133.

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[1] Sometimes many bones on both hands are involved in different stages of the bony changes, constituting dactylitis. In a patient, brought for advice by Dr. Wylie, several of the first and some of the second phalanges, as well as several of the metacarpal bones of both hands, showed the characteristic changes. In another (personal) case, the metacarpo-phalangeal joint of the thumb and great-toe, on the right side, were alone involved.

[2] "Fall von gummöser (syphilitischer) Dactylitis." "Arch. of Derm. and Syph.," No. 2, 1870, and Taylor, *loc. cit.*

As a final result of the absorption of the gummy deposit, the shaft of the bone becomes shortened, or slightly attenuated. In McCready's case (Fig. 134), a whole phalanx, its joint, and a portion of the metacarpal bone disappeared. From these changes great deformity may result, the fingers or toes becoming shortened and distorted. False joints form between the two ends of a phalanx, which have been separated by absorption of the portion of the shaft of the bone. The integument in such cases contracts, and adapts itself to the altered condition of affairs, thus materially strengthening any false joint that may form. The sheaths of the tendons have not been involved in any of the recorded cases.

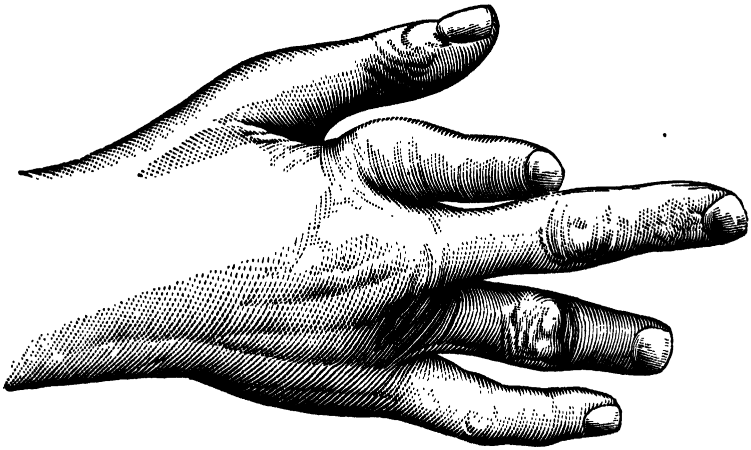

FIG. 134.—(*Taylor.*)

Diagnosis.—Absence of pain distinguishes the earlier stages of dactylitis from whitlow and from gout. In rheumatic arthritis the sheaths of the tendons suffer, generally the flexors, distorting the fingers, and tophi are deposited about the joints and often in the cartilages of the ears. The crepitation in the joints is dry and harsh. Enchondroma grows slowly as a hard, well-defined tumor, prefers the palmar to the dorsal surface, dactylitis occupying more often the dorsum. The characters of dactylitis as described, together with the syphilitic history, would serve to distinguish it from ordinary periostitis, and from strumous disease of the bone.

The prognosis is good if taken early, although the ordinary course of the disease is slow.

Treatment is that of tertiary syphilis. Local inunction of twenty per cent. oleate of mercury, combined with iodide of potassium internally, seems to act promptly. Local measures are, as a rule, unnecessary, except rest and soothing applications to meet inflammatory manifestations.

SYPHILIS OF THE TENDONS, SHEATHS OF TENDONS, AND APONEUROSES.

Verneuil[1] first called special attention to serous effusions into the sheaths of tendons (extensors) on the dorsum of the carpus and metacarpus, on both or on one side, due to syphilis. Effusion comes on promptly, fluctuation can be distinguished, there is no change in the color of the integument. The shape of the swelling is triangular, with the base toward the fingers. It does not extend beyond the dorsal ligament. There is slight pain on pressure, with a little weakness and inconvenience of movement. The affection is secondary, and a few days of internal mercurial treatment causes it to vanish. Verneuil calls it dorsal hygroma.

Fournier[2] speaks of a syphilitic affection of the sheaths of tendons not only about the wrist, but also about the ankle, foot, knee, elbow, etc., and thinks that the sheath of any tendon, superficial or deep, may be affected by syphilis early in the secondary period. Either effusion takes place without any redness of the cuticle or some redness of the latter, and surrounding œdema with considerable pain may be found. Fournier believes that many of the pains found early in secondary syphilis about the knee, and especially about the elbow, are due to affections of tendons of deep-seated muscles, laying stress particularly upon pain in the bend of the elbow increased by pressure, having its real seat not in the bone nor in the joint, but in the tendon of the biceps.

Both *tendinous* and *aponeurotic* tissue may also become the seat of syphilitic lesion, either as interstitial thickening from hyperplasia of connective-tissue elements in a diffused manner, capable of thorough organization, or as a distinct gummy tumor. The tendons are more often involved than the aponeuroses. Gummy tumors of tendons sometimes are absorbed and calcify without destroying the function of the tendon. The more dense and resisting the tendon the more exposed does it seem to be to gummy tumor—tendo achillis, tendon of quadriceps extensor femoris, etc. A tumor of this latter tendon is noticed by Arrzomann,[3] which lighted up hydrarthrosis, and might have passed readily for a white swelling.

CASE LIII.—In 1871, ——, aged forty-three, called for an opinion about an affection of the knee, which forced him to employ crutches. A little over two months previously, from no traumatic cause, he noticed a feeling of weakness and insecurity in the right knee, with no pain. He soon took to his bed from inability to walk, not on account of pain. This was believed by his surgeons to be due to threatening abscess. It subsided, to be replaced by a general swelling, with distinct puffiness above and about the joint. There was total inability to use the leg for locomotion. In this condition, ten weeks after his attention was first called to the disease, he was seen. Examination revealed that he had long been subject to stiffness of muscles and joints, called rheumatism; that he had milk (scaly) spots on the tongue, and nodes on the ulna, skull, and tibia. The right knee was swollen, white, insensitive, slightly warmer than its fellow, containing fluid. There was a distinct amount of induration and thickening, with general puffiness above the patella and a tender spot toward the outer upper side. Syphilitic arthropathy was diagnosticated, and iodide of potassium in increasing doses employed. Under this treatment all the symptoms disappeared. The fluid was absorbed from the joint; the puffiness vanished, the indurated thickening diminished, then became easily movable, and was felt as a broad lump as large as a flattened pullet's egg, situated transversely above the patella in the median line, and seeming to have started in the tendon, and then to have involved a portion of the upper part of the capsule of the knee-joint. The nodes got well, and the patient went on to a speedy and entire recovery, regaining perfect use of the joint.

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[1] "De l'Hydropisie des Gaînes tendineuses des Extenseurs des Doigts dans la Syphilis secondaire." *Gaz. Hebdom.*, 1868, p. 609.

[1] "Note sur les Lésions des Gaînes tendineuses dans la Syphilis secondaire." *Gaz. Hebdomad.*, 1868, p. 645.

[3] Thèse de Paris, 1858.

This case had not been diagnosticated (although under the best of observation), and would have readily passed for white swelling.

Gummy tumors of tendons are not painful. Sometimes they are so, when the muscle contracts, hence such a muscle usually refuses to act at all after a time. The tumors can generally be felt under the skin upon the tendon as hard, circumscribed masses. If they go on to soften, the skin reddens, breaks, and a gummy ulcer is left. These tumors are important, from their liability to be mistaken at first for the little serous swellings found often upon the tendons of the fingers, called ganglia. The history and progress of the affection are the only means of making a diagnosis. Ganglia may be ruptured by a blow, not so a gummy tumor.

Treatment of tertiary syphilis is usually speedily curative.

SYPHILIS OF THE MUSCLES.

Syphilis affects the muscles in two ways:

(*a.*) Diffuse connective-tissue hyperplasia.

(*b.*) Gummy tumor.

(*a.*) Diffuse Form.—This form here, as elsewhere, consists in a hyperplasia of connective-tissue elements. It takes place between the muscular fibres. The new connective tissue atrophies, draws together in its contractions upon the muscular elements, and thus causes their wasting and destruction. Virchow[1] has made a profound study of this condition. He compares the muscular atrophy to the same result following rheumatic inflammation. Any muscle may suffer, but the flexors of the forearm and the biceps cubiti are especially liable to attacks of interstitial myositis. Buisson believes that stricture of the rectum may be caused by syphilitic myositis.

Symptoms.—There is no spontaneous pain in this affection. The muscle gradually shortens without at first diminishing in size and texture (apparently). Forcible extension of the muscle or pressure on the tendon may occasion pain (Notta).[2]

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[1] "Archiv. für Path. Anat.," IV., p. 271.

[2] "Archiv. Génér.," 1850, p. 418

Treatment commenced early has great power over this affection; later, during the atrophic stage, none whatever. Total atrophy of the muscle, with shortening and consequent distortion of joints, is the final result of interstitial syphilitic myositis unrelieved by treatment.

(*b.*) Gummy Tumor of Muscle.—This condition differs from the preceding only in this: that the new material is circumscribed instead of diffused, and is much more prone to soften and discharge externally. Such tumors, commencing in a muscle, may subsequently involve other more importants parts, as gummata of the tongue, palate, pharynx, larynx, which may primarily originate in muscular tissue, or rather its interstitial connective-tissue elements, and, again, gummata of the heart, stomach, etc. Gummy tumor of muscle, however, is usually found in a large muscle, such as the gluteus, trapezius, sterno-mastoid, and pectoralis major.

Symptoms.—A lump appears in the affected muscle, with no pain. It is usually large when discovered, and then continues to grow until it may reach the size of an orange, and interfere greatly with the contractile function. The swelling, not very hard at first, is found to be fixed when the muscle containing it is contracted; movable, when it is relaxed (Nélaton).[1] If cut into early, the appearance is as of a grayish plastic effusion around the muscular fibres, which have lost their color. The skin is not discolored; there may be some pain, especially at night. The tumor now sometimes goes on to grow rapidly and to soften. Perhaps it is opened as an abscess, or discharges spontaneously, in exceptional cases, a thick, mucilaginous mass, perhaps slightly bloody. Interstitial organization and absorption sometimes take place, leaving a hard, cicatricial nodule, perhaps encysted, fibrous in character, possibly calcified.

A muscular gumma may be alone, or may have companions. Usually there are other syphilitic manifestations present to assist the diagnosis. Section of gummy tumor, at its different periods, shows it as a grayish-red, gelatinous substance, or as a yellowish-white, hard mass, looking like the section of cicatrix, perhaps calcareous, or if softened (not organized) it may resemble thick gum, or show any of the stages of cheesy degeneration.

Treatment is that of tertiary syphilis. Local measures are not required.

SYPHILIS OF THE JOINTS.

Early after infection, often with the syphilitic fever, there is complaint of pain in the joints, some of which perhaps become congested, swell, contain an excess of fluid, and are painful on movement. This inflammation is usually insignificant, but occasionally intense enough to pass for mild inflammatory rheumatism. It may attack the joints symmetrically. It rarely relapses. One form of syphilitic joint-disease has already been described in connection with syphilitic dactylitis.

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[1] *Gazette des Hôpitaux*, 1861.

Joint affections are rare in syphilis. Richet,[1] Follin,[2] and others, have given cases. A gummy deposit in the capsule, outside of the synovial membrane, attended by thickening, which may be felt, perhaps movable like a foreign body, and slow effusion into the joint, are the characters of syphilitic synovitis according to Richet, who believes that return of the fluid after absorption is a feature of diagnostic value. There is no fever, pain may be absent, is usually nocturnal when present, and is not aggravated by motion. There is little or no tendency to anchylosis. The knee-joint is the one usually involved. (Case LIII.)

Treatment is often brilliantly effective.

Serpiginous ulcerations around a joint may be attended by stiffening and some effusion into its cavity without actual joint-disease. Richet's second form is articular ostitis. This has been observed in the knee and hip. Here the bone, for some distance from the articulation, is the seat of the disease. There is severe pain, especially at night and on pressure. There is great swelling and a large amount of effusion. The folds of the synovial membrane thicken from a gummy deposit. The cartilages of incrustation become eroded. All the fibrous tissues around the joint may become transformed into a gelatinous-looking, gummy material. False membrane may unite opposite surfaces, and anchylosis eventually result, as in one of Bumstead's[3] cases. Undoubtedly this lesion, if allowed to progress, would eventuate in the disorganization of the joint, but treatment may stop it at any stage, as there is no tendency to suppuration. Richet's two forms of joint affection, it will be noticed, correspond roughly with what is observed in the two forms of joint-disease as seen in dactylitis.

Diagnosis.—In white-swelling there is pain in the joint early, the brawny feel extends over the whole articulation, there are no circumscribed hardened patches. The disease goes on to disorganization. The joint loses its movements early. Anchylosis is common. The great elements of diagnosis in syphilitic arthropathy are the history of the case, the absence of pain, preservation of movement in the joint long after it would have been abolished by a similar amount of disease from any other cause.

Treatment is that of late syphilis, with, locally, rest for the joint and any soothing measures suggested by inflammatory symptoms.

SYPHILIS OF BONES.

Symptoms referable to bones occur in secondary as well as in tertiary syphilis. In very exceptional cases even nodes have been observed early, upon the cranium, before the appearance of the earliest cutaneous manifestations, and on many of the superficial bones along with the earlier syphilides. These phenomena have been chiefly observed and described by Charles Mauriac.[1] They are undoubtedly local congestions of the periosteum, with serous effusion, but probably not much cell-hyperplasia. They always disappear in a few weeks, leaving no trace, or nothing more than a slight thickening (in Mauriac's thirteen cases). But even admitting all these thirteen cases to have been reliable observations, still the rule would remain, that bone-lesions occur late in the evolution of the disease, exceptions to the contrary notwithstanding. Early in the disease, often with syphilitic fever, occur pains of a peculiar variety, called osteocopic. They may be light, or again furiously intense. Sometimes they are absent altogether. The pains are usually of a boring, splitting character, seemingly seated in the depth of the bone. They may be continuous, but usually remit by day to commence again toward evening, or perhaps not until after nightfall. Sometimes they recur at the same hour nightly. They usually cease at break of day, or perhaps continue on for a while into the morning. When they are continuous, there is almost invariably a nocturnal exacerbation, and this character of the pains, although not exclusively a feature of syphilitic bone-pains, is nevertheless so constant, that the occurrence of pain in the bones, with nightly exacerbations, leads at once to the suspicion of syphilis as a cause. These pains are often relieved instead of aggravated by pressure. The seat of the earlier osteocopic pains is about the joints, and in the head and neck. The shoulders, elbows, and knees, often suffer; the continuity of the long bones less often. The pains may leave one point, to pass rapidly to another. They often cease when an eruption comes out, but may continue long afterward. Usually there is neither heat nor swelling at the painful points, but in exceptional instances nodes have been noticed with the earliest eruptions. Mercury has no relation (of causality) to these earlier pains, which in fact disappear under its use, and are often most severe in those who have not used the mineral.

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[1] "Mémoires de l'Académie," 1853.

[2] "Traité de Path. Ext.," p. 714.

[3] *Op. cit.*, p. 653.

Positive lesions of bone due to syphilis occur late in the disease, with the late secondary eruptions, or at any time thereafter. The previous exhibition of mercury is in no way responsible for their appearance, since they occur in cases which have never been treated with that metal, and are not encountered upon patients treated mercurially for other diseases, even salivated. Any bone in the body may be affected by syphilis, but certain of them suffer by preference, such as the thin bones of the nose and pharynx, all superficial bones, especially such as are exposed to slight constant injuries, bones of the skull, the clavicle, ulna, tibia, ribs. Several bones are often simultaneously involved. Usually other symptoms of syphilis coexist with the bony lesions, but not necessarily. The lesion may commence from without, an ulcer eating down, exposing the bone and being followed by specific changes in the latter. Ordinarily, however, the changes commence from within. No better classification can be offered than the one adopted by Lancereaux:

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[1] "Affections Syphilitiques précoces du Système osseux," 1872.

(*a.*) Inflammatory osteo-periostitis.
(*b.*) Gummy tumor of bone.
(*c.*) Dry caries (Virchow), atrophic form.

(*a.*) *Inflammatory Osteo-periostitis.*—The changes in this form commence under the periosteum, and in the Haversian canals of the subjacent bone. The parts become engorged with blood. A sero-glutinous material next appears, which raises the periosteum into an oval swelling, shading off insensibly in all directions. This swelling is called a node. It may be very small, or cover a large area of superficial bone. The skin moves over it, but it is evidently fixed immovably to the bone. It may feel very tense and hard, but is often doughy, or even decidedly fluctuating at first. There may be some surrounding œdema. Nodes are painful to pressure, and often the seat of continuous spontaneous pain, almost invariably worse at night. The pain is aching, acute, throbbing or boring in character. Lesions of the skull often give rise to continual headache. Growing from the inner table of the skull-cap, a node may occasion nervous symptoms, epilepsy, paralysis, etc., or, developing around an emerging nerve, neuralgia, or local paralysis, or in the spinal canal occasion paraplegia.

Nodes, if treated early, promptly subside, otherwise they increase rapidly in size, and may soften centrally. In such cases the skin over them first becomes adherent, then red and œdematous, finally gives way, leaving an open characteristic syphilitic ulcer, with diseased, carious, or necrosed bone at its base (carious ulcer). Portions of bone come away, the ulcer does not extend, but finally cicatrizes, leaving an adherent, depressed scar surrounded by an hypertrophied hardened ridge of bony tissue of new formation.

Instead of thus softening, the node may go on to bony organization, forming exostosis, or leading to permanent general thickening of the normal bony tissue (parenchymatous exostosis). Exostoses once formed, do not disappear. Partial absorption may ensue, but treatment fails to remove the bony ridge, or interstitial thickening, which remains behind, to serve as an important landmark to the surgeon of the previous visitations of the disease.

Epiphysary exostosis is a bony tumor or ridge, which, forming separately, subsequently becomes firmly attached to the bone. They are prominent or flat, of different sizes and shapes, and may be attached to the bone only by a peduncle.

Diagnosis.—It is hardly possible to confound the oval, painful, boggy or hard bony lesion, known as a node, accompanied by its nocturnal exacerbations of pain, with any other lesion. Ostitis with parenchymatous thickening is less positive in its characters, but the history of the case, nocturnal pains, and concomitant or antecedent syphilitic symptoms, rarely leave the diagnosis doubtful.

(*b.*) *Gummy Tumor of Bone.*—Gummy tumor develops either under the periosteum, in the substance of the bone, or in the medullary canal. It is simply an intensification of the process found in the inflammatory form already described, the difference being that the cell hyperplasia is more luxuriant. Much of the new material (gumma) collects in a circumscribed space, and, being more rapidly formed and less capable of organization, it entails more profound lesions by its retrograde metamorphosis. Gummy tumor of bone is therefore a much more serious and inveterate form of disease than syphilitic osteo-periostitis.

Gummy tumors of the periosteum are circumscribed swellings with a fixed base, usually soft and fluctuating, containing a yellowish-white, thick material, resembling a solution of gum-arabic. Like gummy tumors elsewhere, they tend to soften, the skin reddens, inflames, ulcerates, and the broken-down gummy material escapes, leaving behind an ulcer with diseased (necrosed) bone at its base. Sometimes gummy tumor becomes incrusted with calcareous salts, and remains as a permanent swelling, a sort of exostosis.

Interstitial gummy tumor acts differently in the long and in the flat bones. In the long bones, the medullary canal is usually the seat of deposit, which continues through the bony tissue. The bone becomes hypertrophied in a porous manner, the Haversian canals and canalicules being enlarged and filled with gummy deposit, either fresh and gelatinous, or in different stages of degeneration, yellow, white, cheesy, and pultaceous. Thus a portion, or the whole thickness of the bone, may enlarge. In the flat bones, such as especially the cranial bones, the cancellar tissue is attacked (the diploë), where gummy material collects in greater or less abundance, separating the two tables of the skull, and eventually often involving one or the other of them in necrosis, or in caries. Gummy tumors of bone are often exceedingly painful, especially during the nocturnal exacerbation. Although absorption may take place, or calcification, or ossification, yet there is a certain marked tendency to rapid softening of the deposit, and consequent caries, or, more often, a cutting off of a portion of the cortical layer of a bone by the softening of a deposit of gummy material, which underlies and has infiltrated it. By the coalition of many distinct foci, great destruction of tissue may result, large portions of the skullcap, the whole frontal bone (either table or both), large portions of the sides or back of the skull, may necrose and come away, or be removed, leaving the dura mater exposed. In connection with necrosis of the inner table, and accumulation of softened gummy matter in contact with the dura mater, brain-symptoms may occur. Such necroses are common on the skull, and not very rare on the other superficial bones, tibia, ribs. A syphilitic sequestrum is usually worm-eaten, and perforated by many holes, where the gummy material in its deposit has encroached upon or perforated the portion which is thrown off, instead of being smooth on its external surface, as would be a sequestrum from other cause. Synchronously with the separation of the sequestrum, the edges of the bone at and beyond the line of demarcation become thickened, elevated, eburnated, so that after the healing of the ulcer a characteristic cicatrix is left, with the skin adherent, edges hard and raised by an excess of bone, centrally depressed, and filled by fibrous cicatricial tissue.

(*c.*) *Dry caries* has been well known since the publication of Virchow's accurate investigations upon it. Virchow[1] believes dry caries to be occasioned only by syphilis. The affection is rarely found elsewhere than upon the cranial bones. Either or both tables may suffer. The frontal and parietal bones are most often involved. The affection is indeed a miniature gummy ostitis. Around one of the vascular canals of either table of the skull gummy matter is deposited at the expense of bony material. The same change occurs in the lateral vascular canals leading to the vertical canal. The gummy material is finally absorbed, leaving a stellate indentation. This goes on until a funnel-shaped depression is formed, its point leading into the diploë. If, now, the points of two such funnel-shaped cavities coincide, the cranial bone may be perforated. While this atrophic process is going on centrally, new bone is being formed peripherally, both on the surface and in the diploë; thus eburnation of all the surrounding tissue occurs, with hyperostosis superficially. In fact each worm-eaten, depressed, funnel-shaped spot of caries sicca is a miniature syphilitic bone-scar. The feature of caries sicca, however, is that in it there is never any sequestrum, any formation of pus, or any implication of the skin. The symptoms of its existence are local pain, without swelling. The cicatrices (of bone) left behind are pathognomonic of syphilis. They may be plainly appreciated through the scalp by the finger.

Treatment is that of late syphilis.

SYPHILIS OF CARTILAGE.

The cartilages affected by syphilis are only those which are surrounded by perichondrium. Cartilage of incrustation may become eroded, but only in connection with neighboring gummy deposit, either in the fibrous capsule of the joint, or in the articular ends of the bone. Tertiary disease of the larynx commences as a gummy perichondritis, or possibly as a muscular gummy tumor, involving the cartilage secondarily; so of the cartilages of the nose. Lancereaux gives a case of laryngeal perichondritis leading to necrosis of cartilage, local gangrene, and (the accident) subsequent fatal pyæmia. Syphilis of the layrnx will be described with the air-passages. Gummy tumor sometimes develops upon the costal cartilages, leading to necrosis. These gummata tend to soften, and behave exactly like similar formations originating under the periosteum of superficial bones.

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[1] "Ueber die constitutionnelle Syphilis," 1859.

Treatment is that of late syphilis.

SYPHILIS OF LYMPHATIC GLANDS.

Besides the indolent glandular enlargements encountered in secondary syphilis, and already alluded to at length (p. 551, *et seq.*), occasionally these glands become the seat of gummy deposit in tertiary disease, especially in strumous young subjects. Under these circumstances they enlarge painlessly, soften, break down, and discharge, leaving a chronic, atonic, gummy ulcer, which is usually regarded as "strumous," and is very slow to get well. These ulcers look like chancroids. They have, however, hard, adherent edges, and a gummy, false membranous bottom. They occur chiefly about the neck. Such lesions leave puckered, ridged, adherent cicatrices, usually with an areola of pigment around them; possessing, in short, the characteristics of the strumous as well as of the syphilitic scar.

The deep lymphatic glands suffer habitually in connection with visceral syphilis, but these never suppurate. They may be affected alone, the viscera escaping. Either interstitial adenitis takes place at the expense of the connective-tissue parenchyma, by which the gland-cells become pressed upon and atrophied, and finally, by shrinkage of the new-formed connective tissue, the whole gland becomes sclerosed, contracted, and seemingly composed entirely of connective tissue, or a quick proliferation of cells takes place, incapable of organizing (gummy material), the gland becomes plump and large, at first firm, then soft, as the gummy material softens, undergoing its retrogressive changes. Finally, a mass of cheesy degeneration alone is left, perhaps calcified. According to Lancereaux, the glands are often found increased in size in their long diameter, mainly of reddish color, soft and of brittle consistence, more or less cheesy. The deep ganglia most commonly affected are the prevertebral, lumbar, iliac, and femoral; next the bronchial and mediastinal. The mesenteric glands rarely suffer, least often the glands of the extremities.

These deep glandular alterations sometimes exist without symptoms, but symptoms may be caused by them in two ways: First, mechanically, by interfering with function (the discharge of bile, thus occasioning icterus); second, in all probability, by interfering with blood-elaboration, thus holding a large share in the production of cachexia.

SYPHILIS OF THE MAMMARY GLAND.

Mucous patches, as well as all the cutaneous lesions, appear upon the breast, but the mammary gland itself may also be involved in syphilis. Syphilis attacks the mamma in the same two ways in which it affects all glands:

(1.) As a diffuse interstitial parenchymatous inflammation.

(2.) As distinct gummy tumor.

(1.) *Diffuse syphilitic mastitis* is observed in both sexes. Ambrosoli[1] reports three cases; one in a male, the others in females. The gland swells, becomes slightly painful and tense. The skin remains unchanged. No separate tumor is formed. All the cases observed have occurred during the secondary period shortly after cutaneous eruptions. A few indolent ganglia may be found in the axilla. The affection disappears without leaving any trace.

(2.) *Gummy Mastitis.*—Richet[2] mentions a tumor of the breast which he believed to be scirrhous. He prepared to extirpate it, but, finding by accident a tumor in the patient's calf, he paused, reflected, administered the iodide of potassium, and both tumors disappeared. Gummy tumor is rare in the breast, and when found there usually coexists with gummy tumors or ulcers elswhere. It forms with little or no pain, may attain a large size, and then degenerates and discharges externally (when it is liable to be mistaken for cancer), or is aborted. Mastitis is usually bilateral. The course of the disease and its attendant specific history serve to distinguish it from other benign or cancerous mammary enlargements.

CHAPTER XI.

VISCERAL SYPHILIS.

Syphilis of the Vascular System.—Syphilis of the Respiratory System.— Syphilis of the Digestive System, including the Tongue and the Great Abdominal Glands.—Syphilis of the Peritonæum, Thyroid, and Thymus.—Syphilis of the Genito-Urinary System.

Syphilis of the Vascular System.—Of the circulatory organs, the heart most frequently suffers, the arteries next, while no authentic case of syphilitic lesion originating in the veins has been reported.

Syphilitic Pericarditis has been very rarely observed. Wilks, Virchow, and Lancereaux, have seen cases. The affection is tertiary, and is either a diffuse pericardial infiltration or a circumscribed gummy tumor. It rarely occurs except in connection with specific myocarditis. It does not seem to occasion any considerable febrile or other disturbance, and the diagnosis is usually made after death.

Myocarditis due to syphilis is either diffuse or circumscribed (gummy tumor). The two forms may occur separately, but usually coincide. The diffuse form consists in cell-proliferation, attended by hyperæmia and formation of new connective tissue, then destructive metamorphosis with absorption. A yellowish coloration in patches is produced by the fatty changes in the new growth; finally portions of the muscular tissue disappear by absorption.

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[1] Quoted by Lancereaux.

[2] "Traité d'Anatomie Medico-Chirurgicale," fourth edition, 1873, p. 330.

In the gummy form circumscribed tumors of small size appear, preferably in the ventricles where the muscular wall is thickest. The surrounding tissue is the seat of diffuse myocarditis; the walls of the heart thicken; its cavities enlarge; its muscular power is impaired. The valves usually escape. The endocardium and pericardium may both be involved. These heart-lesions are rarely detected during life. Lancereaux diagnosticated a case which got well under the use of iodide of potassium. The course of the disease is long, its beginning insidious.

Symptoms are: increase of size in the heart, enfeeblement and irregularity of its action, palpitation, finally asystole; sometimes præcordial pain and distress, a little dyspnœa, some turgescence of the vessels of the neck, sometimes slight œdema of the lower extremities, rarely any valvular murmur.

Diagnosis.—A syphilitic history, the coincidence of other tertiary phenomena, the usual absence of evidence of valvular lesion, are the main features of a differential diagnosis. Sudden death is the most common termination, but, if treatment be commenced before the muscular tissue of the heart has been materially altered, there is every reason to believe that a cure may be effected.

Treatment is that of late syphilis.

Syphilitic Arteritis.—The arterial walls are subject to gummy infiltrations, either diffused between the coats of the artery for some length, thickening the same and thus decreasing the calibre of the vessel, or developing as a distinct tumor in the vessel-wall. Both forms have been observed. In the larger vessels fatty metamorphosis of the new tissue occurs, with calcification leading to atheromatous patches; in the smaller vessels obliteration of the calibre may ensue. Aneurism may owe its origin to the weakening and softening of the arterial wall by degeneration of gummy deposit, or the vessel may give way, allowing an apoplexy to occur. Weber has a case of pulmonary apoplexy.[1] Any artery may suffer, but the carotids and arteries of the brain most commonly. An accurate diagnosis of these lesions has usually been made after death, as no symptoms during life are pathognomonic of their existence. They are a not very infrequent cause of brain-symptoms, by cutting off the supply of blood. Their presence may be inferred in many cases of aneurism in patients with old syphilis.

No diseases of the veins have been observed. Lancereaux states of the capillaries that their external tunic is the habitual point of origin of gummy tumor, and that fatty degeneration of their coats is observed in syphilitic cachexia, as indeed might be expected *a priori.*

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[1] Quoted by Lancereaux.

SYPHILIS OF THE RESPIRATORY SYSTEM.

The affections due to syphilis occurring upon the skin and mucous membrane of the nose have been already described (Chapters VI. and VII.). The bones about the bridge of the nose are very apt to be destroyed by tertiary syphilis, and discharged either through the nostrils or by ulceration of the skin over them. These destructions of bone are not replaced, and recovery involves a sunken bridge.

SYPHILIS OF THE LARYNX.—The erythema and mucous patches of the larynx, sometimes found in secondary syphilis, have been described (p. 584, *et seq.*). Tertiary changes remain to be observed. There are two varieties:

1. Diffuse non-ulcerative laryngitis.
2. Ulcerative laryngitis.

1. *The diffuse non-ulcerative* form is rare. It consists in chronic diffuse connective tissue, hyperplasia resulting in general thickening of the vocal cords and surrounding tissues, without ulceration, on account of which the voice becomes first hoarse, then reduced to a whisper, per haps, finally, after many months, nearly lost; and difficulty of breathing comes on, gradually progressing with the thickening of the laryngeal tissue, until suffocation becomes imminent. Little or no pain is experienced. Pressure over the larynx is somewhat painful. The affection progresses slowly. Dyspnœa is the main symptom, with modification of voice, and, in the later stages, emaciation, sleeplessness, cachexia, with more or less cyanosis, and a quick, labored action of the heart. The lungs remain healthy. The laryngoscope shows a dark-colored mucous membrane in the larynx, a general thickening of tissues, with more or less œdema and restriction in the movements of the vocal cords, but no ulceration. Œdema of the glottis may come on, rapidly inducing alarming symptoms of suffocation.

Diagnosis.—A history of syphilis, and the absence of tubercular disease in the lung, make the diagnosis between this affection and tubercular chronic laryngitis easy. Treatment is effective in the earlier stages, but not always curative in old cases where new-formed and contracted connective tissue has glued the parts together. Tracheotomy in these cases is the main resource. It may be necessary to wear a tube permanently.

2. *Gummy Ulcerative Laryngitis.*—This is not a very uncommon affection in the tertiary stage of severe or badly-managed cases. It comes on as an ulcer of the mucous membrane, secondarily affecting the perichondrium and the cartilage, or begins under the perichondrium, or possibly as a neighboring gummy tumor. The ulcer may involve the posterior surface of the epiglottis, and indeed be continuous with

serpiginous gummy ulceration of the pharynx. The gummy material under the perichondrium usually softens and ulcerates its way out as it does when forming near bone, and may be attended by necrosis of more or less of the cartilages of the larynx. The laryngoscope shows perhaps non-ulcerated prominences, usually ragged ulcers with considerable surrounding œdema; these appearances sometimes extending through the larynx into the trachea. White contracted cicatrices of older ulcers, which have healed, may also be seen.

The symptoms of this affection are hoarseness, perhaps a whispering voice, possibly total loss of voice, slight laryngeal pain at times, cough, at first dry, then with bloody, purulent expectoration or portions of slough; œdema of the glottis sometimes occurs, but, in any case, respiration becomes eventually seriously impeded. Dyspnœa often occurs in paroxysms. A portion of necrosed cartilage may separate and be coughed up or drawn down into the lungs. The larynx is painful to pressure, sometimes visibly enlarged. Gummy deposit may form in the surrounding tissues, and soften. Emaciation and exhaustion come on, and life is endangered if the disease be not stayed. After the healing of the ulcers, permanent trouble may be left in the larynx by contraction of the cicatrices. During this period the larynx may be found permanently depressed and immovable, during deglutition and attempts at speech (Demarquay).

Diagnosis.—The history of the case, the frequent coincidence of present or old (cicatrized) pharyngeal ulceration, and the usual absence of pulmonary lesions, distinguish this affection from phthisical laryngitis.

Similar changes to those already described for the larynx are also caused (less frequently) by syphilis in the trachea and bronchial tubes, leading often by their cicatrization to permanent stricture, which, if extensive, seriously, perhaps fatally, impedes respiration, as cicatrices are, of course, not influenced by treatment. Hence the importance of an early recognition, and a vigorous treatment of all tertiary affections of the air-passages, so as to prevent extensive ulceration and subsequent stricture.

Syphilis of the Lungs.—In tertiary and in inherited syphilis, the lungs may be affected either by diffuse interstitial chronic inflammation (pneumonia), or by gummy tumor, or both together. Rare in the adult, these changes, especially the diffuse form, are common in the infant with inherited disease.

1. *Chronic Syphilitic Pneumonia.*—This affection may invade any portion of the lung-tissue. It consists in a proliferation of cells, and a new formation of connective tissue in the parenchyma of the lung, by means of which the air-vesicles become decreased in size, or even obliterated, and the portions involved, firm, hard, non-crepitant, elastic. The affected spot is depressed from contraction of the newly-formed tissue; it may be sprinkled with numerous yellow points, seen on section. An

entire lobe is rarely involved all at once. There may be several spots in the same lung. The bronchial tubes terminating in the diseased areas are dilated or contracted, sometimes ending in a *cul-de-sac*, their walls yellow, thickened, opaque.

In the child with inherited syphilis, the whole of both lungs may be involved by changes due to interstitial disease. These organs are found large, dense, fleshy, heavy, discolored. They often show prints of the ribs. Their surface is smooth and marbled. They sink in water. There may be partial emphysema where the air has penetrated. The inter-alveolar tissue is thickened, in some portions more than in others. The bronchial ganglia are enlarged.

2. *Gummy Tumors of the Lungs.*—These may be single or multiple. They are found as yellowish-white tumors of varying size, rarely larger than a marble, firm and elastic at first, then softening, perhaps breaking down. They become surrounded by an indurated connective-tissue wall (encysted). Small vessels pass into these masses at first, but subsequently become obliterated. These tumors undergo the same retrogressive transformations as those which affect gummy material everywhere—central softening, cheesy degeneration, absorption—a cheesy nodule, perhaps calcified, being left behind, or rapid softening with ulceration of surrounding tissue and evacuation of the tumor, usually into a bronchus, followed by a cavity which cicatrizes, leaving a stellate depressed scar. Gummy circumscribed masses in the lung are less frequent in the infant with inherited syphilis than the diffuse form, but they have been occasionally found, sometimes as yellowish, elastic masses, sometimes with commencing central softening. The child rarely lives long enough to allow them to ulcerate out.

Pleural adhesions, cicatrices, and small gummy tumors coexist with syphilitic lung-disease.

Diagnosis.—Syphilitic lung-affections with or without cavity may be diagnosticated from chronic phthisical pneumonia by the history, concomitant changes, the fact that syphilitic disease is not specially prone to attack the apices of the lungs, and, finally, by the effect of treatment.

SYPHILIS OF THE DIGESTIVE AND ABDOMINAL ORGANS.

Erythema, mucous and scaly patches, and ulcerations of the mouth and pharynx have been considered (Chapters VI. and VII.). A word of special description is due to gummy tumor of the tongue. It is important on account of its great liability to be mistaken for cancer. The affection is rare, and is habitually found late in the disease, often after every other manifestation of syphilis has disappeared. Lagneau[1] has collected ten cases. The gummy deposit takes place in the sub-mucous tissue or deeply among the muscles. Any point of the organ may be involved, but the base most frequently.

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[1] "Des Tumors syphilitiques de la Langue." "Archives de Méd.," tome i., 1860, p. 217.

Symptoms.—*Gummy tumor of the tongue* is usually multiple. Small, hard, painless swellings commence under the mucous membrane, or in the thickness of the tongue. These grow slowly to the size of a pea or nut, the mucous membrane over them being at first perfectly healthy. Then the tumor softens centrally, the membrane over it becomes violet colored, finally ulcerates, letting out the gummy matter, if it has become sufficiently softened and degenerated, or exposing it to view as a yellow, false-membranous-looking mass, firmly adherent and gradually deliquescing and sloughing away. These ulcers are indurated at their base and sides, sometimes sprinkled with gangrenous points. They bleed easily. The surrounding tissues are reddened, thickened, œdematous. The ulcer may take the shape of a deep, ragged, oval fissure into the side of the tongue or across its dorsum. The edges are raised and hard, but not tuberculated. Portions of the edges are often undermined. These ulcers have a very slowly-progressive, destructive action, but even without treatment they are often self-limiting, and, after more or less destruction of lingual tissue, the borders sometimes flatten down, soften, granulations spring up and cicatrization ensues, perhaps at the expense of considerable deformity of the organ from loss of tissue.

CASE LIV.—A gentleman, sent to this country by a homœopathic physician to test the virtues of the Missisquoi Spring for "cancer of the tongue," came under observation in the summer of 1872. He had been advised to submit to an operation as for cancer by a prominent London surgeon. A well-marked group of old syphilitic tubercles was found upon the buttock, and this, with an undoubted history of syphilis, justified the free use of the iodide of potassium for the ragged ulcer of his tongue. The treatment was followed by decided benefit. The age and debility of the patient, together with the fact that the iodide was badly borne, prevented more marked beneficial results. The patient died some months later, under the observation of Mr. Henry Lee, of London, who kindly transmitted the following opinion and remarks on the case: "Mr. —— duly presented himself yesterday. I was very much pleased to find that the sub-maxillary glands were not enlarged, which one would certainly have expected had the disease been cancer. In St. George's Hospital some time ago I had a patient, a married woman, whose tongue was ulcerated much more than Mr. ——'s. In this case the parts quite healed, leaving only a small stump of a tongue attached to the hyoid bone. The treatment pursued in this case was sarsaparilla and calomel-baths. . . ."

The beginning of this affection often passes unnoticed. It may be impossible to distinguish the tumors except by pressing the tongue between the thumb and finger, when one or more hard, interstitial lumps are felt. During ulceration the saliva collects abundantly and dribbles away over the lower lip, the mouth being kept ajar for fear of pressing on the tongue. These symptoms continue more or less marked according to the extent of the ulcers. There may or may not be syphilitic cachexia, with gummy tumor of the tongue.

Diagnosis.—These ulcers of the tongue are very apt to be mistaken for cancer. They usually do not return after extirpation, and may get well during a sojourn at this or that spring, or while the patient is consuming this or that nostrum, and thus become evidences of the cure of cancer. In five points, however, gummy ulcerations differ from cancer of the tongue:

1. They commence as sub-mucous lumps, not as superficial, warty growths.

2. The edges of the syphilitic ulcer are not tuberculated.

3. The sub-maxillary glands are involved late in cancerous ulcer, but not all with the syphilitic.

4. In the syphilitic ulcer of some duration it is customary to find certain points cicatrized; not so in cancerous disease.

5. Cancerous disease is somewhat painful from the first. With syphilis there is no pain until the gummy material softens.

Treatment of gummy tumors of the tongue is usually rapidly effective if undertaken before they have ulcerated. After the ulcerations have become chronic they are very slow in yielding, but persevering effort will master them unless the patient be irremediably depressed by cachexia.

SYPHILIS OF THE ŒSOPHAGUS.—Syphilitic ulceration occasionally attacks the œsophagus, either by extension from the pharynx or as a local gummy deposit. West[1] first called attention to these lesions. Virchow has found cicatrices and stricture of the œsophagus in autopsies of syphilitic patients. Maury,[2] of Philadelphia, details a case upon which he was forced to the performance of gastrotomy.

Symptoms of stricture with difficult deglutition usually first call attention to the affection under consideration. The stricture is the result of cicatrization of previous ulceration, and is therefore but little benefited by treatment. Some relief has, however, been noticed in cases which have been diagnosticated. A cure is reported in one case by Follin,[3] but the treatment is mainly that of stricture of the œsophagus by dilatation, etc.

SYPHILIS OF THE STOMACH AND INTESTINE.—Functional derangements of the stomach and intestines are common early in secondary syphilis and in the cachectic stage. Tertiary ulcers have also been occasionally found in the stomach and intestines, and local brawny thickenings (Wagner,[4] Lancereaux, and others), without ulceration. There are no means of diagnosticating these lesions, except continuous diarrhœa with occasional bloody stool and colicky pains, or eructations and vomiting, together with the coexistence of a syphilitic history, visible lesions elsewhere, and more or less cachexia. Such ulcers in the rectum may eventually lead to stricture, but the vast majority of the so-called syphilitic strictures of the rectum are undoubtedly due to chancroid or ulcerated mucous patches.

SYPHILIS OF THE PANCREAS.—Lancereaux has found the pancreas indurated in syphilitic autopsies, and gummy tumors of the same organ have been observed. No special symptoms mark the affection during life.

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[1] *Dublin Quarterly*, February, 1860.

[2] *American Journal of Medical Sciences*, April, 1870.

[3] "Traité Elém. de Path. Ext.," tome i., p. 696, 1861.

[4] "Archiv der Heilkunde," 1863.

Syphilis of the Spleen.—Syphilis may occasion a partial or general splenitis, gummy tumor of the organ, or, according to Lancereaux, an hypertrophy by augmentation of the cellular contents or pulp.

In splenitis the portions affected become hardened, dry, dark-colored, so dark as to be sometimes mistaken for hæmorrhagic foci (Virchow), and difficult to distinguish from inflammatory engorgements. As the newly-formed connective tissue contracts, the affected portion grows harder and paler, and its site is marked by a depression of cicatricial character. A certain amount of peri-splenitis may also occur, occasioning adhesions between the spleen and neighboring tissues and organs.

Gummy tumors of the spleen resemble the same productions in other organs. They occur as one or more rounded nodosities, of dirty yellowish-white color on section, more often superficial than deeply seated. They are of rare occurrence.

In inherited disease the spleen is often firmer and larger than usual; rarely the seat of circumscribed or diffused gummy infiltration. Lesions of the spleen rarely, if ever, occur, except coincidently with other visceral changes.

Syphilis of the Liver.—No viscus is more subject to alteration from syphilis than the liver. This is especially true in cases of inherited disease. Gubler,[1] Dittrich,[2] Virchow,[3] Wilks,[4] Lancereaux,[5] Diday,[6] and others have done much toward elucidating the changes wrought by syphilis in the liver. There are in this organ two distinct forms of syphilitic disease:

1. Interstitial syphilitic hepatitis.
2. Gummy tumor.

1. *Interstitial Syphilitic Hepatitis.*—This is a chronic cell-hyperplasia, occurring either in patches in the capsule of the gland (peri-hepatitis), or in the parenchyma diffused or in patches. There is first hyperæmia then new formation of cells along the course of the vessels, with local or general increase in the size of the organ, finally shrinkage of the newly-formed tissue, and consequent compression of the glandular elements, ducts, and vessels of the organ. On the surface these patches implicate the peritonæum, and adhesions take place with the neighboring structures. The irregular contractions pucker in and depress the liver-surface unevenly, leaving it seamed, fissured, and distorted. The whole organ, or part of it, finally becomes contracted, cirrhosed, hardened, intersected by seams and lines of contracted fibrous tissue more or less thick. The color of a section is yellowish, sometimes darkened, the glandular elements are withered or completely atrophied, some-

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[1] "Mém. de la Soc. de Biol.," t. iv. [2] "Präger Viert. Jahrschrift," 1849–'50.
[3] *Op. cit.* [4] "Guy's Hospital Report," 1863. [5] *Op. cit.*
[6] "Syphilis in New-born Children," "Sydenham Soc. Trans."

times enlarged, amyloid; a darkened spot may mark the position of an occluded bile-duct. Gummy tumor not uncommonly coexists with this form of disease.

The liver, in cases of death from inherited syphilis, has rarely had time to contract. It is found enlarged, globular, hard, elastic, so that, when a portion is pinched between the fingers, it slips away like a piece of cartilage, and does not receive the impression of the fingers. It may creak under the scalpel like fibrous tissue. The color is of a yellowish-pink, on section, shaded with brown. Small white spots appear on the surface of a section, with delicate white streaks radiating from them formed of collapsed thickened blood-vessels. The vessels are mostly empty, so that not much blood can be squeezed from a section. The bile in the gall-bladder is of pale color and sticky consistence, showing deficiency in coloring-matter, and excess of mucus (Gubler). Extravasations of blood into the liver-substance may have occurred. The solid portions of blood resemble soft currant-jelly. The changes above detailed may occupy the whole or only a portion of the liver, or of one of its lobes. Amyloid degeneration of the capillaries and liver-cells is not uncommon. Distinct gummy tumors have also been found in the liver in inherited syphilis, in connection with the above changes.

2. *Gummy Tumor of the Liver.*—These tumors occur in the liver as hard, irregularly rounded, yellowish-white masses of different sizes. They occur in the midst of portions of liver affected by interstitial hepatitis, often just under the capsule. The newly-formed connective tissue is continuous into them, its meshes widening to receive the numerous small nucleated cells constituting gummy deposit. These masses are yellowish, hard, dry, can often be easily separated from the surrounding tissues. A thick, retractile zone of fibrous tissue surrounds each gummy tumor, or group of them, so that, when cut through on section of the liver, the tumor stands out prominently above the cut surface (Lancereaux). Peripherally the tumors consist of fibres and cells, centrally of cells more or less shrunken, granular, undergoing fatty metamorphosis preparatory to absorption. Centrally free oil-globules and granular detritus also abound. These tumors are capable of absorption, leaving depressed hard cicatrices fibrous in character, often stellate in appearance, and, if on the surface of the organ, attached by strong peritoneal adhesions to the diaphragm, or other adjacent structure. They rarely calcify.

Fatty and amyloid degeneration of the liver, often found in syphilitic subjects, is not essentially due to syphilis as a cause, yet the coincidence of amyloid degeneration of the spleen, liver, and kidneys, with the visceral lesions of syphilis, is noteworthy. Amyloid degeneration of the liver is very common in inherited syphilis, and, in the adult, Frerichs[1] thinks that syphilis is one of its most common predisposing causes.

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[1] *Wiener Medicin. Wochenschrift*, p. 113, *et seq.*, 1860.

Acute yellow atrophy of the liver, accompanied by jaundice, fever, local tenderness, and death, is mentioned by Hill[1] as occasionally occurring in syphilis, and as due to it.

Symptoms of Syphilitic Hepatitis.—Early in the disease the liver becomes enlarged, later contracted, and both of these changes are appreciable by palpation and percussion. If amyloid degeneration be marked, the liver may be enlarged to the end, sometimes very considerably. The inequalities and fissures of the surface can occasionally be felt during life. Occasionally there is a little local pain or uneasiness, especially on pressure. The gland is apt to be unevenly enlarged, one lobe disproportionately larger than the other. Adhesions may be sometimes made out. Jaundice is exceptional, and, when it occurs, may be transitory or progressive, and of long duration. It is due sometimes to pressure upon the excretory duct of the liver by enlarged abdominal lymphatic glands, or by the contractions of a cicatrix (Frerichs). Jaundice sometimes comes on several years before any appreciable signs of textural trouble have been furnished by the liver. Ascites is liable to appear after the liver has become contracted. Epistaxis, hæmorrhoidal bleeding, digestive troubles, anasarca, discolored or brownish bloody stools, dense, high-colored, scanty, perhaps albuminous urine, etc.—accompaniments of cirrhosis—may be also found with the contracted syphilitic liver. Tendency to cachexia is more or less marked. No instance has been recorded of a gummy tumor of the liver softening, and discharging into the peritonæum. Absorption is the rule for all such deposits here. Lancereaux gives three symptoms, which, when coinciding with a syphilitic history, are sufficient to make a diagnosis of syphilitic hepatitis. They are: irregularity in the form of the liver, especially if rounded; indurated lumps which can be felt on the surface or fissures of the edge; albuminuria, and cachexia. In the infant, the symptoms of hepatitis are restlessness, rise of pulse and temperature, perceptible increase in size of the organ, local tenderness, vomiting, diarrhœa or constipation; very rarely, if ever, jaundice.

Treatment is that of late syphilis, or by inunction in the infant.

SYPHILIS OF OTHER INTERNAL ORGANS AND TISSUES.

The peritonæum may become thickened in connection with syphilitic disease near the surface of the liver or spleen, both in children and adults.

Changes due to parenchymatous inflammation or occasional gummy deposit have (very rarely) been noted in the *thyroid* and *salivary glands*. *The thymus* in inherited disease has attracted attention since the investigations of Dubois, first published in 1850.[2] This organ, usually found healthy, may be the seat of diffused puriform infiltration, or a material resembling pus may be found collected in one or several cavities. Hypertrophied portions of connective tissue, in a state of fatty degeneration, have been encountered in the thymus by Lehmann.[1]

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[1] *Op. cit.*

[2] *Gaz. Méd. de Paris.*

Thus it would seem that the thymus, like most other internal organs, is subject to two forms of syphilitic attack: a diffuse parenchymatous inflammation with connective-tissue hyperplasia, going on, it would seem, to softening, and gummy tumor, also softening and forming a cavity full of puriform fluid, but not true pus.

SYPHILIS OF THE GENITO-URINARY SYSTEM.

Symptoms and lesions due to syphilis of the different portions of the genito-urinary system have been described, in connection with these organs, in the first part of this work. Attention need only be directed to the great frequency of syphilitic disease of the testicle (p. 432); to the liability of mistaking subcutaneous gummy tumor of the scrotum for disease of the testis; to the occasional occurrence of tubercular patches of eruption, or gummy tumor, upon the urethral mucous membrane, giving rise to a gleety discharge, and possibly symptoms of stricture, both removable by the iodide of potassium; and, finally, to the occasional appearance of renal symptoms, due to syphilis (p. 380), and to the rare occurrence of gummy tumor of the suprarenal capsules, as a possible cause of that peculiar bronzing of the skin known as Addison's disease.

CHAPTER XII.

SYPHILIS OF THE NERVOUS SYSTEM.

The Lesions: Symptoms, Prognosis, Treatment.—General Characteristics of Nervous Symptoms in all Cases.—Syphilis of the Brain.—Syphilis of the Cord.—Syphilis of Special Nerves.

THAT syphilis may produce textural changes in the nervous centres is now universally admitted. Numerous and exhaustive essays and monographs have been written on the subject, and much is yet to be learned. Space allows only an outline of the subject to be given here.[2]

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[1] *Wurzburger Medicin. Zeitschrift*, 1863, vol. iv., p. 7.

[2] Among those who have written most ably on this subject, may be cited: Yvaren, "Métamorphoses de la Syphilis," Paris, 1854; Thomas Reade, *Dublin Quarterly*, 1857—later, London, 1867; Lagneau fils, "Maladies Syphilitiques du Système Nerveux," Paris, 1860; Gros et Lancereaux, "Maladies Nerveuses Syphilitiques," Paris, 1861; Zambaco, "Des Affections Nerveuses Syphilitiques," Paris, 1862; Wagner, "Archiv für Heilkunde," vol. iv., 1863; Virchow, "Die Krankhaften Geschwülste," vol. ii., Berlin, 1864–'65; Meyer, "Constitutionnelle Syphilis des Gehirns;" "Allgem. Zeitschrift für Psychiatrie," vol. xviii., p. 287; Ricord, Beaumés, Ladriet de la Chanière, Zeissl, Braus, and very many others.

In a short study of "Syphilis of the Nervous System," published by the authors of this treatise, in the *New York Medical Journal*, November, 1870, based upon an analysis

Syphilis occasions nervous symptoms in four ways:

1. By lesions of the bony envelopes, cranium, vertebral column.

2. By lesions of the enveloping membranes; dura mater, arachnoid, pia mater.

3. By lesions of the substance of the brain and cord; diffuse parenchymatous inflammation, or gummy tumor.

4. In some way not yet thoroughly explained, probably congestive, where no appreciable lesions are found after death. Syphilis of the brain or the cord, *sine materiâ*, as it is called.

1. Lesions of the Bony Envelopes.—The bones of the cranium are particularly liable to disease in bad cases of tertiary syphilis, in the shape of dry caries, nodes, necrosis, etc. If these lesions affect only the outer table and the diploë, the functions of the brain are not disturbed; but, if the inner table be involved, as it not unfrequently is, an internal node—by pressure—or a gummy deposit, or caries, involving the dura mater in disease, is fully competent to occasion paralysis, convulsions, and disturbances of function of the most varied character. The same remarks hold true of the bony envelope of the spinal cord, though here bone-lesions are far less common than in the skull. Again, periosteal thickenings or disease of bone, about the narrow canals through which nerves emerge, are accompanied by loss of function of the nerve, as facial paralysis from pressure of the seventh nerve, neuralgia in any of the branches of the fifth pair.

2. Lesions of the Membranes of the Brain and Cord.—These are of two kinds (both far more common for the brain than for the cord):

(*a*.) Pachymeningitis.

(*b*.) Gummy tumor.

(*a*.) *Pachymeningitis.*—Syphilitic pachymeningitis is found most commonly over the convex surfaces of the hemispheres, or at the anterior portion of their base, in the region of the sella turcica. It consists of a diffuse thickening of the dura mater, of the outer layer of the membrane (endocranitis), chiefly in connection with bony lesions; of the whole thickness of the membrane; or, mainly of the internal layer, usually coinciding with alternations of the pia mater and brain-substance. On the surface, or in the thickness of the dense, adherent, roughened, injected membrane are usually found yellow, cheesy, new formations, spread out in layers, or circumscribed as tumors, varying from the size of a small shot to that of a nut, slightly or not at all vascular, soft and gelatinous, or tough and consisting of gummy deposit, more or less altered by organization or fatty metamorphosis. Wagner has seen pachymeningitis of the falx cerebri. Occasionally, but less often, the pia

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of thirty-four personal cases observed in private practice, most of the clinical views to be brought out in what follows were elucidated. A careful study of nearly fifty new cases met in private practice, during the last three and a half years, has served to extend and fully confirm the conclusion reached in 1870.

mater and arachnoid are alone affected; they often are so in connection with disease of the dura mater.

(*b.*) *Gummy Tumor.*—Gummy tumor of the meninges occurs in connection with pachymeningitis as the infiltration or tumor of yellow matter above described, the deposit occurring above, within, or beneath the dura mater, or under the arachnoid in the pia and brain. The changes due to syphilis occurring in the membranes of the cord are precisely similar to those described for the brain—a diffuse thickening with deposit of gummy material, infiltrated or in circumscribed masses.

3. LESIONS OF THE SUBSTANCE OF THE BRAIN AND CORD.—These occur in the brain in two forms:

(*a.*) Diffuse syphilitic encephalitis.
(*b.*) Gummy tumor.

(*a.*) *Syphilitic Encephalitis.*—This affection is a parenchymatous inflammation characterized by a diffuse new formation of cells in the connective tissue of the brain. A large extent of substance may be involved, or only a limited portion. Syphilitic encephalitis is often described as softening or as induration. Both forms occur separately, or combined. The newly-formed connective tissue contracts, occasioning sclerosis, and such a sclerosis may break down centrally, or soften in totality.

Local softenings of the brain may be occasioned in syphilis by the obliteration of the cavity of an artery by gummy deposit in its walls, and consequent cutting off of the supply of blood from a part, acting in the same way as an embolus; but, as a rule, as Lancereaux observes, softening of the brain due to syphilitic encephalitis may be distinguished from softening dependent on arterial obliteration, by the absence in the latter of any product of new formation. The softening in syphilitic encephalitis is due to the fatty metamorphosis of the newly-formed tissue.

(*b.*) *Gummy Tumor.*—Gummy tumors of the brain-substance are rare. They occur in the cerebrum and cerebellum, chiefly toward the periphery of the cerebrum, in the anterior and posterior lobes. They are found of varying sizes, single or grouped, nearly always surrounded, whether single or multiple, by a dense fibrous envelope. They are white, or yellow in color, of consistence either firm, cartilaginous, or fibrous, or soft, liquefied or cheesy, depending upon their age and greater or less degree of fatty degeneration. Little masses of proliferated connective tissue are sometimes found along the course of the vessels. Gummy tumors are subject to the same retrogressive metamorphosis in the brain as elsewhere. They soften, and may become totally absorbed, leaving dense fibrous cicatrices behind; they may calcify, or finally, as shown by Lancereaux, the tumor may be absorbed, leaving the fibrous envelope permanently patulous as a cyst, containing a serous fluid, the whole surrounded or not by softening. Such cysts are distinguishable from cysts the result of apoplectic effusion, in that the walls of the latter are impregnated with the coloring-matter of the blood in an amorphous or crystalline state, and from the result of infarction, by the condition of the arteries. The lesions of the substance of the cord, far less frequent than those of the brain, are yet anatomically identical with them: sclerosis, softening, gummy tumor.

It must not be forgotten, in connection with the brain-lesions due to syphilis, that local effusions of blood from previously-diseased vessels in the brain, or in the cord, are often the immediate cause of the startling symptoms appearing suddenly during the course of the disease. The plugging up of an artery, from syphilitic disease of its coat, often also occasions the sudden appearance of symptoms.

4. Syphilis of the Brain and Cord, *sine materiâ.*—Cases of nervous disease with the most various symptoms are found recorded in all the monographs on nervous syphilis where the symptoms, usually at one time yielding partially or entirely to anti-syphilitic treatment, have by aggravation or relapse gone on to the destruction of the patient. In many cases of this nature men of undoubted ability have failed absolutely to find any trace of disease, present or antecedent, either in the brain, its arteries, its membranes, or the bones surrounding it. In other words, the nervous centres seemed perfectly sound, and that, too, when the nervous symptoms preceding death had been of the most serious character, hemiplegia,[1] perhaps with paraplegia,[2] aphasia,[3] dementia,[4] mania,[4] general paralysis,[2] symptoms of softening,[5] etc., all and many others, which might be quoted, going on to a fatal termination. To express this variety of nerve-trouble, the term "*sine materiâ*" has been employed. It is a useful term, and a good one in lack of better. In just what the essence of this nervous syphilis *sine materiâ* consists is not known. Perhaps there are structural changes, but if so they must be very minute to escape so many skilled observers, and in any case they seem to be out of all proportion to the disastrous effects they cause. To allude to only one case: A woman of thirty-seven, five years after infection, has ringing in the ears, diplopia, paralysis of the third pair on the left side, enfeeblement of the left side amounting to hemiplegia, loss of memory, impairment of intelligence, insanity, during a month—all of which symptoms improve under the iodide of potassium, but the patient dies suddenly of cholera, and Ricord finds the brain, its envelopes, and bones, perfectly healthy ("Clinique Iconographique").

Virchow has expressed the opinion, toward which Ricord leans, that in these cases *sine materiâ* there has been "*materia*," but treatment has removed all trace of it before death; but Ricord himself had a case (obs. 86, Gros and Lancereaux), aged thirty-seven, where, during a pustular syphilide in *the sixth month after infection, the patient had* a sudden attack of right hemiplegia without loss of consciousness, and, after improving a little, died in a month, with sudden aggravation of the paralysis. Granting that the material lesion had been removed by treatment in this case, what became of the lesion causing relapse and leading to a fatal issue? A special poisonous action of the syphilitic virus upon the nerve-cells has been adduced to explain these cases. Another similar theory is that the blood, poisoned by the virus, fails to stimulate the nerve-cells, themselves structurally unmodified, to a proper performance of their function, hence paralysis, etc. The objection to these theories is, that, if the virus acts at all purely as a virus, it should *always* (*a priori*) act upon such delicate tissue as nerve-cells, and be more intense in severe than in mild cases of disease, which is not substantiated by experience. The ingenious theory of Knorre or that of Zeissl, that efflorescences on the pia mater may coincide with the earlier cutaneous lesions, and like them disappear after death, or that the pia mater is subject to an eruption like that which we see in syphilitic punctiform iritis—these theories are hardly tenable in connection with such cases as that of Ricord above quoted, where the brain-symptoms occurred five years after infection, for then the time for efflorescences had passed. The probable pathology of nervous syphilis *sine materiâ* is local congestion, more or less intense and of duration more or less long. This of course is only probable, but there are several strong reasons which make it plausible.

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[1] Rodet (two cases), *Gaz. Méd. de Lyon*, 1858; Ricord, obs. 86; Gros et Lancereaux, Follin, quoted by Rollet, p. 913; Zamboco, *op. cit.*, obs. 73.

[2] Gjör, obs. 60; Gros and Lancereaux.

[3] Delaunay, quoted by Tamousky, "Aphasie Syphilitique," Paris, 1870.

[4] Ricord, obs. 78, Gros and Lancereaux.

[5] Ricord, Gros and Lancereaux, p. 13.

1. Other poisons are known to produce local congestions of the skin, internal organs and tissues, nerve and brain, with its membranes. Such are the gouty poison, and the poison of urea in the blood.

2. It is common in cases of nervous syphilis occurring within a few weeks or months after chancre, where death has ensued in consequence of the nervous malady, or been occasioned by intercurrent diseases, to fail to discover any material lesion (Van Buren and Keyes),[1] whereas death from nervous syphilis occurring late after general infection is almost uniformly on autopsy found to be connected with material lesions.

3. Many cases of nervous syphilis, occurring soon after chancre, recover without treatment and without showing any progressive tendency or endangering life, however much they may temporarily injure the function of the nerves involved. Were these due to textural alterations as a cause, their history and progress without treatment would probably be different.

4. At just this early period of syphilis congestion is one of its favorite modes of manifestation, as shown in the erythemata of skin and mucous membrane in the punctiform iritis, etc. Gubler admits a syphilitic con-

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[1] *Loc. cit.*

gestion of the liver. But that cerebral congestion may occur in syphilis late in the disease, as it may in gout and uræmia, is evidenced by Ricord's case at five years, and other autopsies *sine materiâ* at late dates.

5. Tarnowsky[1] quotes a case of Engelstedt's, where, six months after chancre, left hemiplegia and aphasia due to syphilis came on and terminated fatally. At the autopsy the only lesions found were slight meningeal hyperæmia, and a little bloody serum in the ventricles.

6. We know that syphilis causes diffuse chronic inflammation, pachymeningitis, encephalitis: why may it not also occasion a chronic hyperæmia, capable of producing irregularity of function, or even death; or, subsiding, leave permanent functional disturbance behind, with no appreciable structural alteration?—for this latter we know does occur in many paralyses occurring at a short interval from chancres which have not been recognized or treated.

Symptoms of Nervous Syphilis.—The nervous symptoms produced by syphilis are very varied. They must be considered under heads of the separate nervous maladies, and cannot be treated of separately under the different lesions, because any of the given forms of nervous disease, from paralysis through dementia to mania, may occur without a lesion appreciable on autopsy (*sine materiâ*), and because there is no *necessary* constancy of relation between the situation of the lesion when present and the character of the nervous symptoms to which it gives rise.[2] Most of the lesions about the nervous centres affect more or less the meninges, but do not on that account necessarily produce convulsions; on the contrary, a pachymeningitis, or an internal osteophyte, may just as well occasion hemiplegia, aphasia, mania, or other nervous phenomena. Deep-seated gummy tumors or softened spots more often produce paralytic lesions, but do also give rise to convulsions, mania, etc.

Finally, as a set-off to severe, even fatal symptoms *sine materiâ* there may occur fearful destruction, and very tangible tissue-changes due to syphilis, without there being any symptom of nervous derangement other than pain. There are many of these cases on record, such as Botal's[3] case, Duhamel and Legrand,[3] and most strikingly Gama's[4] case, where, although the bones of the face and nose (including the ethmoid) had been destroyed by syphilis, yet pain in the head was the only nervous symptom, and the patient died, having "*preserved the use of all his movements, and of his intellectual faculties.*" At the autopsy the frontal bone was found to be carious in an areolar manner. The most altered points of the bone internally corresponded to little erosions of the dura mater from which pus flowed. An incision through the dura mater evacuated about four ounces of pus, which was covering the cerebral hemispheres. The arachnoid consisted of a black pulp on the dura mater, and a few black shreds over the cerebrum. The pia mater tore off in fragments, and the whole surface of the cerebral hemispheres was of a greenish black, for two or three lines in depth. A part of the front of the left hemisphere was putrid, and all the cerebral lobes softened. The cerebellum was similarly affected, but to a less extent, and yet in this person pain in the head was absolutely the only nervous symptom. After the above statements, he must be a good prophet who will with certainty predict the lesion to be found as occasioning a given nervous symptom.

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[1] "Aphasie Syphilitique," Paris, 1870.

[2] Quoted by Van Buren and Keyes.

[3] Van Buren and Keyes, *loc. cit.*

[4] Obs. 87, Lagneau fils.

As to what the symptoms of nervous syphilis are, however, it may be stated, judging from the vast number of symptoms already observed, that, like hysteria, it is proteiform: there is probably no symptom of any known nervous malady functional in character, or due to an organic cause, which may not be occasioned by syphilis. In describing the different paralyses, mania, etc., due to syphilis, it will be noticed, however, that they usually have certain characteristics which distinguish them from the same affection due to other causes. Brown-Séquard has justly remarked that the disorderly grouping of nervous phenomena should lead us to interrogate syphilis as a cause; as, paralysis of some muscle of the eye and paraplegia; or paralysis of one hand and the other foot, etc.

Prognosis of Nervous Syphilis.—It cannot be positively affirmed, of any given individual with syphilis, that he will never have nervous disease due to his acquired diathesis, yet the majority escape. A certain percentage suffer, and there does not seem to be any controlling diathesis which directs syphilis toward the brain, unless possibly the gouty. Severe cases of the disease, where ulcers destroy the tissues, and the bones decay, not unfrequently escape any, even the faintest, manifestations of nervous disease. Others, dying of syphilitic cachexia, with perhaps gummy tumors in most of their internal organs, may never lose power in a single muscular fibre, or fail in sensation, or falter in intelligence, consciousness, or speech, and yet either of these type cases may have nervous syphilis severely or lightly. On the other hand, the mildest case which may have been untreated, or have undergone a treatment for a while, may come down suddenly with any of the forms of nervous disease at a short (more commonly a long) period after his chancre.

Case LV.—A young gentleman, of twenty-two, had syphilitic chancre in 1870, with indurated, non-suppurating, multiple bubo. He was put at once under treatment, and took his medicine regularly for a time. No symptoms whatever appeared, no eruption, or sore-throat, no falling of hair, in fact, nothing to mark the disease, except one unmistakable, characteristic, indolent, indurated post-cervical ganglion. Eighteen months after chancre, following a few days of headache (he had discontinued his treatment, and lived in a dissipated, irregular manner), he was seized with hemiplegia, hebetude, loss of memory, and difficult articulation, all without loss of consciousness, and of distinctly syphilitic type, and recovered entirely under resumption of his treatment in about ten days. This was undoubtedly a case *sine materiâ*; but, unrecognized and untreated, it might perhaps have left slight permanent functional disturbance behind.

In short, that syphilis attacks the brain in some, but lets others escape, we know; but, why it does so, we do not know. Irregular or injudicious treatment has undoubtedly something to do with the development of nervous disease, but does not necessarily occasion it. The prognosis, however, is good in proportion as the manifestation is near in point of time to the chancre, and in proportion as intelligent treatment is speedily brought to bear upon the case. The lightest cases, untreated or treated too late, may result in permanent functional disturbance.

In any case, and as a general rule, no symptom of nervous syphilis, however alarming, need necessitate a fatal prognosis, especially if treatment has not yet been pushed; some cases seem almost to rise out of the grave under the influence of the iodide of potassium. Always with a given symptom, the prognosis is better if syphilis can be made out as a cause, than if any other disease or lesion has occasioned it. Many cases of obscure brain-disease, which are benefited by the iodide of potassium, are undoubtedly unrecognized remains of old, perhaps forgotten, syphilitic poisoning.

The vast majority of cases occur late in the disease; others, appearing early, are manifestly and promptly benefited by mercury, as are probably all cases where the lesion is not gummy. These, it must be remembered, are very exceptional. Nervous symptoms, due to syphilis, are found in inherited (Keyes and Van Buren,[1] J. Hughlings Jackson,[2] and others) as well as in secondary and tertiary disease.

General Treatment of Nervous Syphilis.—In the treatment of nervous syphilis, the delicate nature of the tissue involved must always be borne in mind. The greater the promptness of action, the more efficient the treatment. In the forms occurring early after chancre, mercury alone is indicated, but even in these cases it is better to stand ready with the iodide of potassium. Could we decide with certainty in a given case that the lesion was purely gummy, the iodide alone would be all-sufficient, but, as more or less pachymeningitis may be inferred to exist in most cases, it is better to adopt for nervous syphilis a mixed treatment, with the iodide largely in excess. It is the latter agent which most quickly controls the symptoms in desperate cases, not in mincing, therapeutic doses, but in specific doses of gr. x–xx, commencing at which the remedy should be run up as rapidly as the stomach will bear it, until the symptoms are stayed and forced into a retreat. This result may be confidently counted upon in all cases where the diagnosis is accurate, and treatment is not commenced too tardily, and pushed too indolently—if the stomach is sound. The effect of opium upon pain is not more wonderful or more striking than that of the iodide of potassium upon the nervous manifestations due to syphilis. Nerve-tissue cannot be reproduced by treatment, and often irreparable damage is done to nerve cells and fibres by the lesions due to syphilis. Hence in many cases functional disorder, more or less pronounced, remains behind. In these cases treatment can only arrest the disease, and prevent progress; not replace nerve-tissue already destroyed.

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[1] *Loc. cit.*

[2] "Transactions of St. Andrew's Medical Graduate's Association," vol. i., 1868.

GENERAL CHARACTERISTICS OF THE NERVOUS SYMPTOMS DUE TO SYPHILIS OFTEN ASSOCIATED WITH DIFFERENT NERVOUS AFFECTIONS; AND THEIR POSSIBLE CONFUSION WITH HYSTERIA, SUNSTROKE, GOUT, ETC.—To give the nervous symptoms of syphilis would be to detail nearly all the functional nervous aberrations which are witnessed in the most manifold disorders. Thus the symptoms may be purely paralytic, general, or localized (hemiplegia, squint), or functional (aphasia, boulimia—Fournier), or intellectual (insanity), or all may be combined. Then there may be merely an emotional disturbance, shown by a tendency to laugh and cry from insufficient cause, to become gloomy and despondent, occasionally exalted, to show great peevishness and irascibility in place of former sweetness of disposition, to get hypochondriacal and hysterical, to evince dullness of perception, to lose memory, talk slowly, accept ideas with unwonted deliberation and delay, and deliver them with still greater slowness and lack of vigor. There may be partial or total hebetude, and dementia. Some of the above mental peculiarities are almost certain to be found in all cases of physical disorder due to brain-syphilis, but it is chiefly where they occur alone that they are unheeded and their true cause overlooked. A feeling, for instance, of mental weariness, a giving out of the mind after any slight effort of the brain, such as reading the daily paper; inability to think long on any given subject without a "wretchedness" and "distress" in the head, "a misery," as some patients call it; symptoms of this order have been found by the authors to be very common with paralytic and other nervous manifestations due to syphilis, and occasionally to occur as the only evidence of disease. All these symptoms evince a lowered grade of nerve-power, due to the overshadowing influence of syphilis, and, as they may occur alone, their study is of vast importance. They often lighten up visibly, as treatment takes effect. Cases resembling in every respect true hypochondria (not syphilophobia—the patient may never suspect syphilis to be the cause of his distress), and occurring in syphilitic patients, frequently find relief only after an anti-syphilitic course. An instructive case is reported by R. W. Taylor,[1] of this city, of a young married woman whom he had treated for syphilis in 1870. Fourteen months after her chancre she began to have dull, supra-orbital pain (not worse at night). She was constantly troubled by dizziness. She walked unsteadily, and felt as if she must inevitably fall backward. These vertiginous feelings were prolonged and painful; they never went to loss of consciousness. She was treated in the country for hysteria, with no result. She became sad, despondent, emaciated. Her digestive functions were all normal. She was irascible and full of emotions and abstractions, dejected, despondent, and suspicious, imagining that her friends were making fun of her, easily frightened. Her memory had become very poor.

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[1] *Boston Medical and Surgical Journal*, December 24, 1871, p. 395.

This picture is not a very uncommon one, although such positive emotional disturbances usually coincide with more evident and tangible physical symptoms, such as convulsions, paralyses, etc. This girl had never been hysterical before the attack above recounted. Treatment for hysteria in the country, where she was in good hygienic surroundings, was useless; two months of mixed anti-syphilitic treatment in the city effected a cure.

Another form under which nervous syphilis frequently goes undetected is that of sunstroke. Many an individual, seemingly overpowered by the heat on a summer's day, has in fact had an explosion of pent-up nervous syphilis, which goes unrecognized, and leaves him with impaired brain-power, high emotional excitability, some loss of memory, and perhaps some partial paralysis, for all of which the sun gets credit, and no effort is made to combat the syphilitic cause. Several cases of this class have fallen under the authors' notice. One peculiarity, often strikingly evident in patients suffering from nervous disease due to syphilis, is, that they are often shy, distrustful, slow to recognize that syphilis has any thing to do with their symptoms. It is hard to elicit facts from them, and patient tact may be required in their management to keep them up to treatment.

Great care also is necessary in the study of nervous syphilis, to avoid confounding some of the manifestations of severe nervous gout with those of syphilis. Between them there exists a wonderful resemblance. Thus cerebral congestion, dizziness, and vertigo, perhaps culminating in aphasia, irritability of temper, suspicious tendencies to the extent of mild illusions, tendency to an easy tiring of the brain, and the production of a vexed, distressed feeling in the head, local neuralgia as of the sciatic, numbness along the course of certain nerves, especially the radial and ulnar, etc.—all these, and many more nervous symptoms, are found in cases of well-marked nervous gout, as well as in syphilis, and, when, added to this, it is remembered that certain of the dry, papulo-squamous, gouty eruptions, which come chiefly in summer, are purple in appearance, and do not itch much, the chances for an error of diagnosis become greatly increased. As all of the above symptoms may be due also to syphilis, a careful study of the case, and weighing of all evidence cautiously, are necessary to establish a diagnosis. If the symptoms are due to the effects of the gouty poison, the alkaline and eliminative treatment is best adapted to overcome them; if to syphilis, anti-syphilitic remedies. The manifest improvement which follows a correct diagnosis in these cases amply rewards the surgeon for the time and trouble often required to establish it.

Passing from these general evidences of nervous disturbances due to syphilis, it becomes necessary to review the different special diseases. This may be more systematically done by considering them under three heads: syphilis of the brain, syphilis of the cord, and syphilis of special nerves.

SYPHILIS OF THE BRAIN.—Besides the aches and pains of early syphilis, and the general evidences of brain-disturbance affecting the intellect or the emotions, as noticed above, we have to consider hemiplegia, epilepsy, chorea, general paralysis, aphasia, and insanity, all liable to occur as consequences of syphilis affecting the brain.

Syphilitic hemiplegia rarely appears until several years after chancre. It has been occasionally observed within six months. The attack may, but rarely does, come on slowly; it is usually sudden, and there have been as yet few, if any, well-authenticated reports of cases of syphilitic hemiplegia where there was *total loss of consciousness with the attack.* Hence this sign is of the first importance. The patient may be getting out of bed, sitting a moment on its edge, doubting nothing, yet when he attempts to get up he pitches forward into the corner of the room and finds himself paralyzed,[1] or lying by a fence to shoot blackbirds, evidently perfectly well, when, endeavoring to raise himself to take aim, he may discover that his arm and leg are powerless.[2] More often the patient is found lying where he has fallen, unable to give an account of himself, more or less completely hemiplegic, but yet not unconscious. The attack usually occurs before forty, and not late in life, as in hemiplegia from ordinary causes. Fixed headache, usually worse at night, generally precedes the attack for several weeks, getting gradually worse. Pressure often increases this pain, although there may be no external evidences of disease upon the skull. The sensibility of the paralyzed side is usually preserved, or is less affected than the motility, although loss of sensibility, motion being preserved, occasionally occurs. Paralysis of the face sometimes comes on and lasts a few days before the rest of the side suffers; the leg or the arm may be first affected, with or without previous numbness or tingling of the extremities before the attack. Vertigo or convulsions confined to one side not uncommonly precede the seizure. Sometimes it takes a day for loss of motion to become complete. The intelligence is usually, indeed always, impaired, the emotions active, brain-power lôw. Mydriasis, so common with many forms of nervous syphilis, due to brain-lesion (being, indeed, a feature of diagnostic value, especially if the patient be unconscious of its existence, as is often the case), often accompanies the attack and long outlasts it. There may be intense hebetude, stupidity, almost idiocy.

Hemiplegia in a mild form, due to syphilis, may come on and disappear rapidly several times without appreciable exciting cause. If treated early, such cases are usually entirely curable.

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[1] Case I., Van Buren and Keyes, *op. cit.*

[2] Case III., ibid.

Syphilitic epilepsy occurs several years after chancre, but, like all other rules in syphilis, this also has its exceptions.[1] Ordinary epilepsy occurs before puberty, the syphilitic epileptiform convulsion rarely before thirty; the reason being the same for bringing the date of epilepsy late in life as for bringing that of syphilitic hemiplegia early; namely, most patients get syphilis at about the age of twenty. The aura is not necessarily present in syphilitic epilepsy. Nocturnal attacks are not characteristic of it, as was once thought; nor is the occurrence of many attacks in quick succession, with a long interval of calm, necessarily conclusive. The main symptoms for diagnosis are three:

1. Persistent headache before the attack.
2. The age of the patient when the attacks commenced.
3. Aggravation of stupidity, intellectual distress, and general *malaise*, after the attacks.

The intellectual phenomena are the same as already detailed.

Treatment often effects perfect cures.

Chorea, catalepsy, and general paralysis have been noted but very rarely among the nervous diseases due to syphilis. They have none of them any special distinguishing marks, except their coincidence with other syphilitic symptoms, and the fact that they are curable by appropriate treatment.

To *syphilitic aphasia* the same remarks apply. Tarnowsky,[2] in his excellent monograph founded on the collection of fifty-two cases of syphilitic aphasia, has failed to point out any distinguishing mark for it, except the concomitant of the syphilitic diathesis and the possibility of speedy cure by appropriate medication. It is by no means an uncommon form of nervous syphilis.

Syphilitic Insanity.—Many different forms of mental alienation have been observed upon syphilitic patients often,[3] coincidently or alternating with other positive evidences of nervous syphilis. Neither syphilitic mania nor insanity has yet developed by its history any specially trustworthy diagnostic features. Coincidence of other troubles, nervous or physical, due to syphilis, should have weight in deciding the treatment, which latter not uncommonly produces wonderful results. In our rapidly-advancing knowledge of the power of syphilis in producing various forms of mental derangement it becomes obviously the duty of those in trusted with the care of the insane to examine them physically with care in search of evidences of constitutional taint. Perhaps, the two most valuable symptoms to be elicited on examination are, morbid tendencies of the subcutaneous surfaces of the tibiæ and irregularly dilated pupils.

SYPHILIS OF THE CORD.—The cord is less commonly the seat of syphilis than the brain. The lesions affecting the cord, as already detailed, are disease of the bones inclosing it, meningeal thickening, diffuse connective-tissue proliferation of the parenchyma of the cord, with hardening or spots of softening, and gummy tumor. It has not yet been distinctly made out whether or not locomotor ataxia may be directly due to syphilis. In three cases observed by the authors the connection seemed evident and other symptoms came in to confirm the diagnosis, but in only one did treatment prove of the least benefit, and in that case not very marked. In one case there was evident well-marked syphilitic paraplegia, at one time with loss of power and wasting of the legs. This improved under the treatment, and the patient dispensed with crutches. His legs grew large and strong, and subsequently well-marked locomotor ataxia came on, his bladder continuing paralyzed. Treatment of the ataxia was ineffective, and the patient died. No *post mortem* could be obtained.

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[1] We have observed a case one year after chancre; and Bumstead, p. 627, one after a few months.

[2] "Aphasie Syphilitique," Paris, 1870.

[3] Cases XXXI. and XXXIII., Van Buren and Keyes.

Syphilitic paraplegia is very rarely complete. The impairment of motion usually comes on gradually many years after chancre. The extremes of time, as observed by the authors, are eight months and twenty-one years.[1] The bladder always suffers, sometimes before the general attack, always during its continuance, and general treatment has but little effect over this symptom. The sphincters are rarely, if ever, relaxed. The expulsive power of the rectum is usually greatly diminished. Sensation is not affected as a rule. In a few cases (Petrequin, Zambaco) there has been loss of sensation in the legs without loss of motion.

One case of syphilitic paraplegia has been observed by the authors in inherited syphilis, the child being five years old.[2] There is rarely any complaint of pain in the back while the disease is coming on, but it may occur, together with numbness of the extremities. Convulsive motions are rarely present. The feeling as of a girdle around the body is quite common, but not pathognomonic. The affection rarely comes on until long after all symptoms, secondary and tertiary, have disappeared. Zambaco[3] believes that the only peculiar sign by which syphilis may be distinguished as a cause of paraplegia is rapid amelioration under treatment commenced promptly. Lancereaux states that incomplete paraplegia, with pain along the nerves and contraction of muscles, indicates meningeal lesion; while complete paraplegia, no pain, and preserved reflex motion, indicate medullary lesion.

Syphilis of the cord *sine materiâ* occurs.

The intellect is usually sound with paraplegia, but emotional irregularities can usually be detected on study. Paraplegia does not necessarily imply that the preceding syphilis has been severe, and, although one of the latest affections of syphilis, still the eight months' case[4] shows the possibility of exception.

Treatment is less effective in paraplegia than in any other nervous affection. Still something can always be gained, and a cure may be hoped for, if too much time has not elapsed before treatment is commenced; often, where the effects of disease cannot be removed, its course may be stayed permanently by an intelligent course of management. The bladder requires separate care (catheter, injections, etc.).

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[1] *Loc. cit.*

[2] Case XXVII., Van Buren and Keyes.

[3] *Op. cit.*, p. 927.

[4] Case VI. Van Buren and Keyes.

Syphilis of Special Nerves.—Among the symptoms to be ascribed to affections of special nerves must be mentioned, the facts made out by the patient investigation of Fournier, of the occasional existence (especially in women) of localized areas of analgesia, which, while they may take place on nearly all the cutaneous surfaces, have, as a point of special election, the backs of the hands, where pinching and pricking of pins are often unobserved by patients so affected. This perverted sensibility comes on early in the secondary period of syphilis, and, if not removed by treatment, gets well spontaneously.

But there are more positive symptoms, due to lesions of special nerves, requiring attention. The lesions occasioning them are numerous —syphilitic disease of the long, bony canals through which they pass, pressure from neighboring gummy tumor, disease at the origin of the nerve, thickening of the nerve-sheath, interstitial neuritis, and interstitial gummata. From some of the above causes single muscles or groups of muscles anywhere in the body may become paralyzed, but it is impossible to systematize such lesions in a text-book. Suffice it to say, irregularly-distributed paralysis without a valid explanation for its irregularity should always excite the suspicion of syphilis. The nerves most commonly affected are the seventh pair, the fifth pair, the motors of the eye, and the spinal nerves. Lancereaux believes that the sympathetic may be specially involved, and, although there is no reason to the contrary, still nothing is absolutely proved in this direction. The nerves of special sense do not always escape. The sense of taste is rarely injured, except by such ravages as destroy the palates (when smell and taste are both defective), and occasionally where the tongue is the seat of syphilitic tumor (Zambaco). The sense of smell suffers in all the syphilitic necroses of the bones of the nose, especially where the ethmoid is involved. With pachymeningitis about the base of the anterior cerebral lobes the olfactory bulbs may be involved. In such cases sight is pretty sure to suffer as well as the sense of smell. Sight may be impaired by gummy exudation in various situations, neuritis, etc. Galezowski[1] believes that, where the optic nerve is involved previously to its entry into the globe, sight is defective in both eyes. Most of the troubles of vision due to syphilis depend upon syphilitic changes in the media themselves of the eyes (*see* Chapter VIII.). Deafness may also be found to depend upon syphilis. Sometimes it is transitory, occurring during the early eruptive stages, or it comes on late in the disease, due to syphilitic affection of the bones of or around the ear, or destructive ulceration of the pharynx implicating the Eustachian tube (*see* Chapter IX.), or to disease implicating the portio mollis.

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[1] *Gazette des Hôpitaux*, p. 106, 1866.

Third Nerve.—The nerves of the eyes are frequently involved in syphilis (*see* Chapter VIII.). Of all nerves, the third suffers most frequently. Its early paralysis may occur in the exanthematic stage of the disease, but this form soon gets well, and is unimportant. Later on it indicates more serious, usually cerebral disease. Its main symptoms are ptosis, divergent strabismus, and mydriasis. Of these, the latter is the slowest to disappear. Where there is disease of the optic nerve, or the retina, mydriasis may be the effect of lack of sensitiveness of the latter to light; but, where the eye is healthy, and mydriasis occurs, syphilis is often to blame. Victor de Méric has given some instructive cases.[1] If there is only mydriasis, without any other evidence of disease in the third nerve, it is believed that only the short ciliary branches, coming from the fore-part of the lenticular ganglion, are the seat of the lesion.

Myosis has been observed (without iritis) in one case of syphilis, by Lawson Tait.[2] It had existed a long time, and disappeared under the iodide of potassium.

These symptoms, ptosis, squint, and mydriasis, especially the latter, are not usually found alone, but accompany some of the other more considerable evidences of syphilitic nerve-trouble. They are all susceptible of cure under treatment.

Fourth Pair.—Graefe, who attributed "nearly half" the cases of paralytic trouble he met with about the eye to syphilis, has reported one case of syphilitic paralysis of the patheticus (*see* Chapter VIII.), the symptoms being double vision, with one image above the other.[3] The authors have seen one similar case.

Fifth Pair.—The syphilitic affections of this nerve, in a mild degree, are sufficiently numerous. Neuralgia of one or all the branches of the nerve is usually the symptom, more rarely hyperæsthesia or anæsthesia. These symptoms may come early, and are then easier of relief; later, with other evidences of severe nervous syphilis, they are not so manageable, but still they yield more or less good results to the intelligent use of the iodide.

Sixth Pair.—Paralysis of this nerve is quite rare. Follin says that sharp pains around the orbit usually precede it. Symptoms are, double vision and converging strabismus. Treatment often will cure such cases, an operation will not.

Seventh Pair.—Paralysis of the facial nerve is not uncommon, and is interesting both on account of its liability to appear early in the disease, within a few weeks after infection, and from the fact that it sometimes precedes hemiplegia by several days, announcing it as it were. When facial paralysis due to syphilis occurs alone, not connected with other manifestations of profound nervous disease, it is liable to come early. Bassereau and Vidal de Cassis have each recorded two cases within the first few weeks after infection. Van Buren and Keyes have reported a case[1] during the second month. Alrik Ljunggrén[2] gives several others, occurring alone and quite early in the general malady. Many other cases, coming on during the first few months, might be cited. These early paralyses are mild, there is rarely any pain, and they tend to get well quickly, under the continuance of ordinary anti-syphilitic treatment, appropriate to secondary disease. The variety that occurs late is more apt to be occasioned by some severe lesion of the bone, brain, or nerve, and its removal is generally difficult and slow. When occurring late in syphilis, facial paralysis is but one of a group of phenomena, paralytic, intellectual, and emotional, with a general train of forerunning and accompanying symptoms, such as has been already traced, antecedent pain, amnesia, emotional excitability, etc., etc. The attack may be sudden, or slowly progressive, painful or not, perhaps followed by hemiplegia. It is rare for both facial nerves to suffer at the same time.

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[1] *British Medical Journal*, 1870, pp. 29, 52—cases of syphilitic affection of the third nerve producing mydriasis, with and without ptosis.

[2] Ibid., 1870.

[3] "Archiv für Ophthalmologie," Bd. i., 2. Heft, §§ 813–818.

Evidence is accumulating concerning the effects of syphilis upon the other pairs of nerves, but as yet there are no positively fixed facts to be guided by, although it is evident that no nerve in the body is certainly free from possible implication, by syphilitic disease.

Spinal Nerves.—Local neuralgias, anæsthesia, analgesia, paralyses, contractions and wasting of groups of muscles, are the symptoms characterizing lesions of special spinal nerves, such lesions being within or without the vertebral canal. Sciatica, pleurodynia, etc., occurring during syphilis, and getting well under anti-syphilitic treatment, are not very uncommon. Atrophy of single muscles or groups of muscles affected with syphilitic paralysis is more rare.[3]

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[1] Case V., *loc. cit.*

[2] "Klinische Beobachtungen über Visceral-Syphilis."—*Archiv für Derm. und Syphil.*, No. 2, 1870, p. 141.

[3] Case XIX., Van Buren and Keyes, is an example in point.

CHAPTER XIII.

INHERITED SYPHILIS.

Inheritance from either Parent, the other remaining sound.—Abortion due to Syphilis.—Date of Appearance of Symptoms.—Symptoms.—Visceral Syphilis.—The Syphilitic Countenance.—Treatment of Inherited Syphilis.

Syphilis may be acquired by a healthy baby from nursing a woman with chancre, or mucous patches of the nipple, or through vaccination. When so acquired, the disease is essentially the same as in the adult. It is called infantile syphilis. When inherited, however, its course and symptoms are modified. Syphilis may be inherited from a mother who has had the disease, but does not at the time appear to be suffering from its symptoms; or again, if she become infected at the moment of impregnation, or during gestation up to the end of the seventh month, after which time, according to Diday,[1] the child escapes.[2]

Syphilis may probably be inherited from the father, the ovum becoming poisoned by impregnation with an unhealthy germ, the mother being healthy. As the fœtus develops, the mother becomes syphilitic. This point is not yet absolutely decided, certain excellent authorities claiming that, if the mother escapes, so does the child necessarily (*see* note, p. 521). Finally, either a father or a mother may be syphilitic, pass along well into the tertiary stage, and then produce healthy children;[2] or a healthy child may be born while the parents are under treatment, which being discontinued prematurely, a subsequent child may be syphilitic,[2] or, in one of the natural lulls of the disease,[2] the wife not yet having been contaminated, a healthy child may be born; then the father having a relapse, and the mother becoming infected, the next child is syphilitic. A syphilitic mother is far more liable to produce a syphilitic child than a father, who, at the moment of impregnation, may have been under treatment, and for procreative purposes sound; not so the mother, whose intimate anatomical connection with her child during nine months is certain to communicate to it some of whatever poison she may possess, unless she is under continuous treatment.[2]

The ability of a father to infect his child, without at the same time poisoning his wife, has been questioned by high authority. This undoubtedly is of less common occurrence than is supposed, but it may happen. The power of poisoning offspring wanes with the age of the disease, but not so rapidly, seemingly, as does the power of communicating it to one of the other sex. Thus, with the woman, syphilis may have been acquired from a former husband; with him, as is usual, she miscarries several times. Finally, a child is born with eruptions on its skin, and visceral syphilis, from which it dies in a few days. The next child is born, perhaps, fat and apparently healthy; it continues so for two or three weeks, and then gets the snuffles and cutaneous symptoms. Neglected, it dies, or under careful management gets well. The next child seems healthy, does not develop any marked disease during its infancy, but, growing up, may have the syphilitic teeth, interstitial keratitis, etc. After the birth of this child the husband dies, and the wife marries a healthy man. She has lost her power of communicating syphilis to him. They have a child, who appears and continues healthy, but who, at some time during boyhood, has evidences about the mouth, the bones, or the glands, of mild tertiary disease, the father remaining healthy.

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[1] "De la Syphilis des Nouveaux-nés."

[2] *See* note, page 521.

Changing the sex of the foregoing examples, it becomes evident how, late in the disease, after the power of direct communication has been lost, a father, through a healthy, uninfected woman, may beget a child, who, continuing healthy for several years, may finally evince signs of undoubted syphilitic disease, which will yield to appropriate treatment, the mother remaining healthy. Most of these problems of inherited syphilis are still undecided. They are not for the theorist, but for the clinical physician to solve. It is impossible yet to speak with absolute conviction upon some of them.

Abortion due to Syphilis.—A syphilitic woman usually aborts. If no treatment be employed, abortions continue, perhaps at later and later months, until finally a living child, with inherited syphilis, is produced. When a woman who is distinctly syphilitic becomes pregnant, a continuous mild mercurial course offers her the best chance of bringing a living child into the world. The causes of abortion do not seem to lie in syphilitic disease of the womb, but in a blasting of the vitality of the fœtus, through visceral syphilitic disease, and through fatty degeneration of the placenta (Barnes).

Date of Appearance of Symptoms.—The date at which the syphilitic poison may manifest itself in an infant who has inherited it is variable. The germ may be blighted, and early or late abortion ensue; the child may come into the world covered by an eruption and with advanced syphilis of the liver, thymus, etc. Most often, however, the child is born seemingly healthy, but fails to gain weight, and develops an eruption, with snuffles, etc., somewhere during the third or fourth week. It may be two or three months before positive signs appear, but this is rare, and much more uncommon, though still possible, is the lapse of several years before symptoms come on. Cases are not very infrequently encountered where a growing or full-grown child first presents evidences of syphilis, the disease being unmistakably inherited, perhaps the father known to be syphilitic, yet neither the child nor the mother can be brought to confess directly or indirectly any antecedent syphilitic disease. That there may have been some undiscovered symptom in babyhood must be allowed, but still it is as near a certainty as possible, without absolute proof, that a child of a parent whose syphilis has nearly run out, may show no signs of disease until many years after birth, and then the lesion will be of a bone, a joint, a gland, the eye, or perhaps there will be a patch on the mucous membrane of the buccal cavity, an ulcer of the nose resembling lupus (Case LI.), or some other single localized lesion, usually passing undiagnosticated as far as its etiology is concerned. These symptoms were often designated by the older surgeons by the somewhat vague term of "strumous," as evincing characteristics which were not absolutely identical with those of scrofula. The popularity of Astley Cooper's well-known tonic for struma, in early childhood (corrosive sublimate in Huxham's tincture of bark), is probably explained in this manner.

SYMPTOMS OF INHERITED SYPHILIS.—A child born with inherited syphilis often manifests no evidences of the disease at the time, unless it be that he has more of the weazened, old-man look, and dried-up appearance, than is common with babies at birth. This condition may hold for several weeks, or months, before eruptions appear. The infants in the mean time do not take on flesh, they continue thin, the skin becomes more sallow, dry, and wrinkled, they look bloodless and mummified, the eyes seem large, and the expression is one of aged, unearthly, half-idiotic intelligence.

Before affairs have reached this pass, the junction of the skin with the mucous membrane at the different mucous orifices usually begins to show some signs of disease. Fissures, chaps, excoriations, mucous patches, ulcers, appear about the lips, in the mouth and throat, at the edges of the nose, around the anus, genitals, and buttocks, groins, axillæ, umbilicus, etc. The child gets the snuffles; its nose first runs, and then becomes stopped up by the swelling of the membrane and the collection of mucus, pus, and blood. If the nose is entirely stopped, nursing is interfered with. The disease may go on in bad cases to ulcerative destruction of the cartilages and bones of the nose. This nasal inflammation sometimes extends downward through the pharynx into the larynx, occasioning a hoarseness of the cry often observed in syphilitic children. Great or small (mucous) patches of livid excoriation appear on the buttocks, legs, and trunk, oozing a little thickish fluid, which partly scabs into a dark crust; perhaps these patches become the seat of true ulceration, especially around the anus and in the groin. Among the scabbed excoriations and scattered patches may appear a roseolar eruption, the tint of which is particularly livid, and soon assumes the coppery-brown. Usually there are papules scattered through the eruption, either small and acuminated, or broad and flat; the latter in convenient situations, kept moist and warm by being overlapped by skin, become mucous patches. Papules appear by preference about the palms, soles, and buttocks. Subcutaneous tubercles are seen in some cases. Pustules are not wanting in feeble children, but the excoriation and mucous patch of the skin are most common and most characteristic.

Infantile pemphigus is encountered in syphilitic children. That it may occur from simple cachexia, without any virulent cause, has been hotly contended, and is exceptionally correct, but it is vastly more common to find it upon syphilitic subjects. It indicates a bad type of disease. The child may be, and not infrequently is, born with it, or it may come out with other manifestations of the disease some days after birth. It consists in bullæ, varying in size from a pin's-head to a penny—usually about as large as a split pea—filled with sero-pus, which rapidly becomes purulent, situated upon a reddened, excoriated base, surrounded by a red areola, which latter is sometimes slightly thickened and raised. When the bullæ burst, thickish scabs with a green tinge form, and underneath them ulceration goes on.

The palms and soles are the favorite seats of syphilitic pemphigus, but in bad cases the eruption spreads from these points until it may cover the entire body. Almost all cases die, though occasional recoveries have been noted.

The nails in children do not suffer from syphilis so often as they do in adult life, yet they are not exempt. The best description of the changes in the nails in children is given by Hutchinson;[1] one or more nails on each hand split and become dry, cracked, jagged. The matrix may suppurate, and the nails be shed several times. The affection is very rare. It runs a chronic, obstinate course.

The eyes of young infants do not suffer very often, except from conjunctivitis in connection with the coryza.

The testicles usually escape, but may become the seat of gummy deposit.

The bones, except of the nose, are not often involved in the first series of troubles of the infant. If it survive these, later on bony lesions develop just as in the adult, nodes of the skull, clavicle, tibia, etc., and other periosteal and interstitial bony lesions. Induration in the shafts of the long bones of children, and a softening of the cartilages at the epiphyses, tending to terminate in suppuration under the periosteum, are met with upon syphilitic children, and were first pointed out by Bouchut[2] as due to syphilis.

VISCERAL SYPHILIS IN CHILDREN.—Of more importance than the lesions already alluded to, is the visceral syphilis of young children.

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[1] "Pathological Transactions," vol. xii., p. 259.

[2] "Maladies des Enfans nouveaux-nés," 1861.

Their tender organs, blighted in the bud, in the early stages of the disease, while cutaneous symptoms are still superficial, readily take on interstitial proliferation of connective tissue, and gummy change, which properly (in the adult at least) belong to the later manifestations of the disease. Even the brain and cord do not escape. Schott[1] gives a positive example where a gummy tumor of the liver, and another under the anterior cerebral lobes, were found in a syphilitic child born before term with pemphigus of the palms and soles. Case XXVII. of Van Buren and Keyes[2] is that of a boy with inherited syphilis, who had an eruption at three weeks. During the fifth year, nodes on the tibia and ulna, and two slight attacks of syphilitic paraplegia.

Some cases of hydrocephalus are believed to have been due to inherited syphilis. Gros et Lancereaux, De Méric, Roger, Hutchinson, Lancereaux, and Hill,[3] give cases of idiocy with inherited syphilis. Several cases of severe nervous syphilis with inherited disease are reported by J. Hughlings Jackson.[4]

The internal organs most frequently found affected in children dying with inherited syphilis are, the thymus, liver (where Thiry, Wedl, Zeissl, Shott, Lancereaux, Testelin, and others, have observed gummy tumor in inherited disease), lungs less often; peritonæum, kidneys, spleen, brain, cord, etc. The lymphatic ganglia are liable to enlargement in inherited syphilis (Hutchinson, Lancereaux, Rivington), and the suprarenal capsule does not escape (Huber, Hennig). The changes occurring in these organs have already been detailed in connection with similar lesions in the adult. The testicles suffer in inherited as well as in acquired disease. The lesions have been detailed (p. 432). The authors have seen a case, as have Worth,[5] Bryant,[6] and others.

Lancereaux,[7] referring to cases by Förster, Eberth, Roth, and Oser, describe an enteritis as an essential evidence of hereditary syphilis in new-born children. The lesions are rounded indurations of variable size, situated upon the surface of Peyer's patches, and on the solitary glands, some covered with smooth mucous membrane, others ulcerated deeply. The mass shows, on section, numerous small round cells and connective-tissue hyperplasia.

The thymus in syphilitic babies is nearly always diseased (*see* page 643).

The prognosis in inherited syphilis is bad, just in proportion to the date of appearance of the symptoms, and the general physical condition of the child. Nasal catarrh, if severe enough to hinder nursing, vomiting and diarrhœa, as interfering with nutrition and indicating implication of the liver, make the prognosis worse. If a child is born with a general eruption, death is almost inevitable.

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[1] "Jahrbücher der Kinderheilkunde," 1861.

[2] *Loc. cit.* [3] Page 224.

[4] "The Transactions of St. Andrew's Medical Graduates' Association," vol. i., 1868.

[5] *Medical Times and Gazette*, 1862. [6] Ibid., 1868. [7] *Op. cit.*

THE SYPHILITIC COUNTENANCE.—To Mr. Hutchinson[1] the profession is indebted for the development of many important and interesting facts in connection with the subject of congenital syphilis, especially as indelibly stamped upon the individual after his earlier childhood. These appearances, until Hutchinson called attention to them, had either been ignored, unobserved, or attributed to scrofula. They are briefly these.

A child who has inherited syphilis, who perhaps has never shown marked evidences of the disease in babyhood, becomes somewhat blighted in his development. His skin is coarse, earthy, pallid, perhaps showing cicatrices. He has a squared face, prominent cheek-bones, overhanging forehead, and a sunken bridge to his nose. He looks prematurely old and grave, and may have chronic catarrh, interstitial keratitis, ulceration of the throat, or cicatrices of the mouth or soft palate. The permanent teeth are irregularly set and defective, especially the two middle upper incisors, which Hutchinson calls the "test-teeth." These are small, often converging, sometimes diverging. The cutting-edge of the teeth is sometimes narrowed, rounded off, whence the name "pegged teeth." They are stunted and badly developed, often marked with seams (lines, ridges) in front, and of a dirty-brownish color, but their chief peculiarity is found in their edges, which, being thin when cut, break off centrally, leaving a "broad, shallow, vertical" notch on the lower border of the tooth. This becomes smoothed down with advancing years, but the size and shape remain to indicate a blighted tooth. Not all children with inherited syphilis have these teeth, but many do, and the sign is well worthy to be carefully watched for. It not infrequently happens that one child of a family has the notched, pegged teeth, while brothers and sisters born afterward escape, yet still any of these latter may late along in childhood develop some periosteal thickening, some indurated scaly patch on the skin, or mild, raised, excoriated, insensitive patch of thickening on the mucous membrane of the mouth, which the practised eye and touch recognize as syphilitic, and which melts away, under the magic treatment boldly administered, like snow before a summer's sun.

Treatment of Inherited Syphilis.—Before a child is born, if there is reason to believe that it is syphilitic, its treatment should be commenced by bringing the mother mildly under the influence of mercury. In this way abortion may be averted, and the child's life saved.[2] A positive effect of mercury should be aimed at, without, if possible, producing any diarrhœa or intestinal irritation, which are recognized by most observers to be in themselves efficient causes of abortion. Consequently the proper treatment for a syphilitic pregnant woman is inunction.

By common consent also, the treatment of the child is by inunction. The oleate of mercury, five to ten per cent., may be used, in place of the more irritating mercurial ointment, by Brodie's well-known method, being spread upon a flannel belly-band, or it may be alternated between the soft skin in the flexures of the axilla, elbow, and knee. The quantity should be decreased as soon as the symptoms begin to yield, and the inunctions continued for many months after the disappearance of all symptoms. Gray powder is largely used in infantile syphilis, in doses of the fraction of a grain, but there is every objection to internal treatment, as being uncertain in dose (even a healthy infant constantly regurgitates and vomits), and liable to irritate. There is no conceivable objection to inunction, even if the body were one vast ulcerated mucous patch. The extra care required for the inunction would have to be given to the child in any case. If the infant survives a few months, iodide of potassium may be administered through its nurse. Locally the sores require only cleanliness, with (in special cases) some ointment or dusting with calomel and iodoform.

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[1] "Means of recognizing the Subjects of Inherited Syphilis in Adult Life," *Medical Times and Gazette*, September, 1858, p. 265, and art. "Reynolds's System of Medicine."

[2] *See* Thurmann's case, note, page 52.

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